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CONTENTS OF PREVIOUS NUMBER

FEBRUARY 1920. NUMBER 2

The Mechanism of Eye Loss and of the Vitreous, Henry Power, C.M.G., Sidcup, Kent, England.

Cyst of the Crystalline Lens of the Iris of the Pupillary Membrane in a Case of Persistent Synechiae with Secondary Glaucoma, W. Wilmer, M.D., Baltimore.

Meningiomas Arising from the Tuberculum Sellae with the Syndrome of Primary Optic Atrophy and Bitemporal Field Defects (Combined with a Personal Case), Tumors in the Middle Cranial Fossa. (Concluded.) Harvey Cushing, M.D., and Louise Eisenhardt, M.D., Boston.

Interstitial Keratitis with Unusually Marked Chorioretinitis. Pathologic-Anatomic Examination of a Case, W. P. Ling, M.D., Peking, China.

Unilateral Degeneration of the Macula, with Microscopic Report of a Tumor-Like Mass in the Macular Region. T. B. Holloway, M.D., Philadelphia, and F. H. Verhoeff, M.D., Boston.

The Regeneration of the Aqueous Humor, Peter Clemens Kronfeld, M.D., Vienna, Austria.

Obituary:
Lucien Howe, M.D.

Notes and News.

Abstracts from Current Literature.

Society Transactions:
The New York Academy of Medicine, Section of Ophthalmology.
Royal Society of Medicine, London, Section on Ophthalmology.
The German Ophthalmological Society.

Book Reviews.

Directory of Ophthalmologic and Otolaryngologic Societies.

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THE RELATIONSHIP BETWEEN INFLAMMATION OF THE POSTERIOR SINUSES AND DISEASE OF THE NERVUS OPTICUS *

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STRASBOURG, FRANCE

The topographic situation of the eye, the anatomic structure of the walls of the orbits and the numerous communications between the organs of the orbits and the sinuses sufficiently explain the frequent and direct transmission of infection from the sinuses to the eye and its adnexa. It is known that a large number of ocular conditions often have their origin in the nose, particularly in the cavities of the sinuses; among these may be mentioned cases of phlegmon of the orbit, disturbances of the lacrimal apparatus, different degrees of exophthalmos and optic neuritis. The causal relations between infections of the sinuses and many diseases of the eye are well known today, but formerly this was far from being the case. I remember that in 1893, as a young ophthalmologist, I was called in consultation in a case of orbital phlegmon, and when I proposed a rhinologic examination before deciding on surgical intervention, physicians objected, considering my proposition as useless and far-fetched. Fortunately, opinion has changed, and collaboration between rhinologists and ophthalmologists is considered of the first importance in diagnosis and treatment. Today one must avoid attributing to infections of the sinuses every eye disease the origin of which is still unknown. The treatment, naturally, depends on one's diagnosis.

In taking up this question, I intend first to mention some conditions of the nervus opticus that really originate in the sinuses. These conditions do not occur frequently. In many cases they are due to malignant neoplasms of the sinuses, the regional and general metastases of which sometimes extend to the nervus opticus. The remaining cases are almost always cases of inflammatory sinusitis that result in optic neuritis, unilateral or bilateral. The interpretation of these cases is seldom difficult, especially if examination of the sinuses shows inflammatory lesions. Their evolution is generally slow; the diminution of the vision is progressive. In an early stage, the papilla shows a pathologic modification from simple papillitis to atrophy, with consecutive disturbances of

* Submitted for publication, Dec. 21, 1928.

* Read before the Section on Ophthalmology, New York Academy of Medicine, Oct. 15, 1928.

function. There is another group of conditions of the nervus opticus, however, concerning which physicians have not as yet come to a definite agreement, in spite of a large number of researches and publications: these are the cases of neuritis retrobulbaris acuta, and I shall deal chiefly with this condition. In doing so, I shall refer to my personal observations and to a communication I made in 1923 before the French Society of Ophthalmology.

It is of great importance in every discussion first to define as exactly as possible the terms of the discussion; in this case, it is especially necessary, as it has been shown in many articles and discussions that even ophthalmologists often confound neuritis retrobulbaris acuta with true optic neuritis accompanied by obvious lesions of the papilla. In the following article, I shall consider only classic neuritis retrobulbaris acuta. This disease has the following characteristics: It is generally unilateral, occurs among young people, chiefly females, and is marked by a sudden and serious diminution of the vision with central scotoma, which results in total blindness without any obvious changes of the fundus during the acute period of the disease. The last point is the most important, and I believe that the best definition of neuritis retrobulbaris acuta is: a disease in which neither the patient nor the physician sees anything.

If in such cases the etiology is thoroughly studied, it is possible that when the present idea that the disease has its origin in the sinuses is discarded, it will be found that it originates in the teeth. The etiologic consideration has always a direct influence on the treatment; and so, in these later years, those favoring the origin in the sinuses have insisted on the necessity of an early surgical operation on the posterior sinuses. The theoretical point and its practical consequences both appeared to me to be too positive. So I attempted to investigate the literature concerning this point to learn, first, whether the rhinologist often observes neuritis retrobulbaris acuta in recognized cases of posterior sinusitis, and, second, whether in recognized cases of neuritis retrobulbaris acuta ophthalmologists often observe lesions of the sinuses.

The conclusions from my research are based on numerous statistics, the details of which you may find in the aforementioned article. The conclusions are as follows: 1. The rhinologist practically never observes neuritis retrobulbaris acuta associated with posterior sinusitis. 2. The ophthalmologist practically never sees lesions of the sinuses in cases of neuritis retrobulbaris acuta.

These observations seem to solve the difficulty. On the other hand, surgical intervention often produced a rapid and definite amelioration of the vision even in cases in which there was no visible inflammation of the sinuses, and in such cases the condition has been spoken of as latent sinusitis, which is supposed to be unrecognizable, the results of

the clinical as well as of the anatomic examination being negative. Some physicians have gone still further; the interventionist has pretended that even without any signs of sinusitis it is necessary to resort to surgical intervention if after three or four days no amelioration of the vision is observed; otherwise the patients are liable to become blind. To answer this last conclusion, I referred to my personal observations to find what happened to my patients with neuritis retrobulbaris acuta. I found that among more than forty cases that I recollected I had observed a progressive, almost total restitution of vision without surgical intervention in more than 85 per cent. This agrees with the observations of numerous ophthalmologists in different countries where the question has often been discussed and where it has again been studied recently.

Hence one may conclude that: 1. The prognosis of neuritis retrobulbaris acuta, even without surgical intervention, may be considered favorable. 2. The origin of neuritis retrobulbaris acuta should be sought somewhere else than in the posterior sinuses.

Physicians have sometimes observed the occurrence of multiple sclerosis in patients afflicted with neuritis retrobulbaris acuta. Charcot and his students (Magnan, Liouville, Parinaud) early observed the frequency of neuritis retrobulbaris acuta in multiple sclerosis, and insisted that the serious functional eye troubles were out of proportion to the absence of visible modifications of the papilla. According to these physicians, the ocular conditions are of great value as often being the first and the unique sign of the nervous disease. Later the work of the French school was forgotten. In Germany, some authors discovered this relationship again, while in the United States, France and Belgium the hypothesis that the disease had its origin in the sinuses was still defended with persistence.

I have observed that among patients who have had a neurologic examination, a large number present signs of multiple sclerosis from the beginning of their condition; others show these signs only some years later. I was surprised to find multiple sclerosis regularly in typical cases of neuritis retrobulbaris acuta presenting the following classic development: attack on the second eye following the attack on the first eye after a longer or shorter period of time, general debility, sudden onset with rapid loss of vision and central scotoma and occurrence more frequent among women and among women under 35 years of age. The signs of multiple sclerosis are lacking in atypical forms; among these I may mention cases affecting both eyes simultaneously from the onset, with slower evolution and less serious diminution in the vision. In these cases, I think one is dealing with inflammations of the region of the chiasma and of the sella turcica of sinus or of neoplastic origin. Multiple sclerosis seems to me to be the cause chiefly in classic

neuritis retrobulbaris acuta. On the other hand, the diagnosis of multiple sclerosis presents great difficulties in many cases. Neurologists do not agree concerning the frequency and the diagnosis of this disease, which seems to present rather important regional variations. In a number of cases, I have seen patients examined by two or three authorities in neurology, some of them admitting, others rejecting, the existence of multiple sclerosis. From numerous conversations that I have had with distinguished neurologists, I have learned that the diagnosis of multiple sclerosis in its beginning is exceedingly difficult, and that often only the absence of abdominal reflexes is present, together with neuritis retrobulbaris, to indicate the multiple sclerosis.

But there are cases, and I have seen many of them, in which, in spite of exhaustive neurologic examination, signs of multiple sclerosis cannot be detected at the onset of neuritis retrobulbaris acuta, and in which obvious signs of this condition confirmed the diagnosis only after a few years.

I think I am not wrong if I say that, among the patients with neuritis retrobulbaris acuta, a large number (in my statistics at least two-thirds) are affected with a more or less obvious multiple sclerosis, and I should not be surprised if this number should constantly increase with the progress of neurologic diagnosis. The cases of atypical neuritis retrobulbaris acuta, however, such as I mentioned before, have, I think, a different etiology, this disease most often emanating from a lesion of the sphenoidal region or of the sella turcica.

Under these conditions, it seems at least exaggerated to advise surgical intervention as a general practice in typical cases of neuritis retrobulbaris in the absence of any obvious lesion of the sinuses. I know that many physicians consider this intervention painless and harmless; but one should not forget that most of these patients are affected by a serious nervous disease necessitating the avoidance of every nervous or operative shock, and that, moreover, in many operations on the posterior sinuses, serious and often fatal complications have occurred. At most, one should be contented with the innocuous application of procaine hydrochloride-epinephrine hydrochloride to the mucous membrane.

Summarizing, I believe that if it is true that infections of the posterior sinuses often extend to the nervus opticus, their manifestations do not appear in the form of neuritis retrobulbaris acuta. This condition is to be considered as being the first and often the unique sign of multiple sclerosis. It does not call for surgical operation on the sinuses.

The solution of the problem in neuritis retrobulbaris acuta, as well as in many other diseases particularly interesting to ophthalmologists, will be found only by systematic collaboration between different specialists, particularly between otorhinologists and neurologists.

RETINAL DEGENERATION IN MACULAR REGION WITHOUT CEREBRAL SYMPTOMS*

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The types of retinal degeneration in the macular region are based on differences in the ophthalmoscopic picture and also on the presence or absence of associated mental involvement. The following six cases are reported as examples of the macular type of maculocerebral degeneration (Oatman) or of progressive family degeneration in the macular region without psychic disturbance (Stargardt).

REPORT OF CASES

CASE 1.—W. F., a boy, aged 11, seen on March 24, 1915, said that his sight had been failing for one year. There was no consanguinity, familial history or hemeralopia. His previous illnesses were meningitis (?), measles, mumps and cyclical albuminuria. He was a healthy-appearing, intelligent boy. Vision with correcting glasses was 20/70. The field showed a central scotoma. The optic nerve and vessels were normal. In both macular regions, there were superficial choroidal changes consisting of depigmentation and irregular pigment hypertrophy. Surrounding this area, there were many small blurred grayish foci. A subcutaneous tuberculin test was positive, and a course of tuberculin therapy was instituted but did not cause any change in the condition of the eye. The patient was observed at intervals until 1923, when the vision in the right eye was 20/100, and in the left, 20/70; the fundus picture was unchanged. According to a recent letter, the condition has not changed.

CASE 2.—G. S., a girl, aged 15, was first seen on May 15, 1923. She was well developed and intelligent. There was no consanguinity or familial history, except in the case of one brother; hemeralopia was not present. The patient's sight had been poor for several years. Except that she had had scarlet fever and tonsillitis, she had always been healthy. Recently, she lost some weight and felt tired, and albumin was present in the urine. Sight was 20/200; central scotoma was present. The optic nerve showed temporal atrophy. There was a pigmented area at the macula, and this region was surrounded by a ring of faint yellowish-white foci. The tonsils were removed. The patient reacted to the tuberculin test, and a course of tuberculin therapy was carried out. When last seen on Oct. 19, 1926, the vision was 20/100. There was no change in the fundus picture.

CASE 3.—H. C., a woman, aged 29, was seen on May 23, 1923, through the courtesy of Dr. E. W. Blake of New Haven. Her sight had been slowly failing for nine years. She had always been well, and appeared healthy. Vision was 20/70 in the right eye and 8/200 in the left; paracentral scotoma was present. There was optic temporal atrophy and central choroiditis (superficial choroidal changes, pigment atrophy and glistening spots) surrounded by a clouded retina with many small white areas. A recent report stated that the condition had not changed.

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* Presented before the American Ophthalmological Society, Washington, D. C., 1928.

Case 4.—T. McD., a youth, aged 19, was first seen on March 12, 1925. He was one of five healthy children. There was no consanguinity or familial history. Sight had been poor for many years. Vision in the right eye was 15/200 and in the left, 20/200; central scotoma was present. The optic disk and vessels were normal. There were superficial central chorioretinal changes surrounded by a wide ring of small white foci. The tuberculin test was positive, and a course of tuberculin treatment was instituted. At a recent examination, there was no change in vision or fundus.

Case 5.—I. M., a boy, aged 15, was seen on March 11, 1926. Two years before, his sight was found affected at a school test. There was no hemeralopia or family history of affected vision, except that two uncles had retinitis pigmentosa. Vision was 20/100 in the right eye and 20/40 in the left; central scotoma and temporal optic atrophy were noted. The macula showed pigmentation; this area was surrounded by a concentric zone of many faint, blurred, whitish spots situated in the deeper layers of the retina. On Dec. 15, 1926, the condition was unchanged.

Case 6.—C. S., a boy, aged 13, first seen on May 19, 1926, said that sight had been failing for six months. He was one of seven children, and the brother of the patient in case 2. There was no consanguinity; the boy was healthy and intelligent. Vision was 20/100 in the right eye and 20/200 in the left; central scotoma was present. The optic nerve and vessels were normal. Pigmentary changes were seen in the macula. This region was surrounded by many pale round areas. On Jan. 15, 1928, the condition was unchanged.

The points of similarity in these six cases can be best seen in the following table:

Comparison of Six Cases

Case	Approximate Age at Onset	Vision		Field	Fundus	Optic Defect	Vessels	Heredity	Familial
W. F.	10	20/100	20/ 70	Central scotoma; periphery normal	Pigmentary or slight chorioretinal changes in macula surrounded by many grayish foci in retina	None	None	None	None
G. S.	12	20/200	20/100			Temporal atrophy	None	None	Brother
H. C.	20	20/ 70	8/200			Temporal atrophy	None	None	None
T. McD.	17	15/200	20/200			None	None	None	None
I. M.	13	20/100	20/ 40			Temporal atrophy	None	Retina pigmentosa 2 uncles	None
C. S.	12	20/50—	20/ 50—			None	None	None	Sister

In brief, the onset was in the second decade, generally about puberty. The patients were intelligent and appeared healthy. Consanguinity did not play a part; none of the parents was affected. There was no evidence that the condition might be hereditary, except that two uncles of the patient in case 5 had retina pigmentosa. In cases 2 and 6—the sister and brother were affected. Hemeralopia was not present. The eye changes were present in both eyes. Amblyopia varied from 20/40 to 8/200; a central scotoma was present with a normal peripheric field. The ophthalmoscopic changes were pigmentary or slight chorioretinal changes at the macula, surrounded by many small grayish spots. These spots were nonpigmented; they were situated beneath the retinal vessels, and were often arranged in a zone concentric to the macula or to the

Retinal degeneration in macular region without cerebral symptoms.

UNIV. OF MICH.

posterior pole. The rest of the fundus was normal. The optic nerve presented a temporal atrophy in three cases; the retinal vessels were normal. There has not been any progress in four of the cases through a period ranging from two to thirteen years. In two cases, there has been a slight advance in the visual loss. There was no reason to associate this condition with tuberculosis or any other constitutional disease.

In the associated condition, maculocerebral degeneration, the ocular disturbance begins at an earlier age, and the retinal and mental disturbance progress to the patient's death. In the group just outlined, the process was a milder one, beginning later in life, and it was stationary or progressed to a slight degree. No other degenerative defects were found in the eyes. Unfortunately, examinations for color blindness or dark adaptation were not made.

This condition was first described by R. D. Batten[1] in 1897, and attention to this important type was particularly drawn by Stargardt in a number of publications. Other valuable contributions on macular degeneration were made by Best, Doyne, Oatman, Behr and Gifford. Cases similar to those described in this paper have also been published by Feingold and Alkio and others. Leber, in his masterful presentation of retinal diseases in the Graefe-Saemisch "Handbuch," described this condition of the macular region as a form of tapetoretinal degeneration often associated with colloid excrescences of the lamina vitrea of the choroid, which appear as small, pale yellow or grayish spots scattered over the macular and papillary areas. The genetic identity suggests similarity of the process to retinal degeneration, though retinal pigmentation is absent, and its localization to the region of the macula and to the posterior pole is peculiar. The field defect, instead of being a ring scotoma or peripheric contraction, appears in the form of a central scotoma; hemeralopia is absent.

Stargardt divided familial macular degeneration into four groups: presenile (guttate, Tay), honeycomb (Doyne) congenital (Best) and progressive retinitis (with and without psychic disturbances). Behr

1. Rayner D. Batten wrote me concerning the two cases of macular degeneration which he reported in 1897, that he had seen the younger brother on one or two occasions since, the last time about four or five years ago: "There was little or no change in the condition of the fundus or in his vision, and he was still carrying on his occupation; so I gathered was his brother whom I did not see.

"The condition would appear therefore to become stationary and there was no development of any cerebral symptoms.

"My hospital notes on Harry Squance, the younger brother, are as follows: Admitted July 11, 1918, H. S., aged 34, married, occupation, butcher. Right eye, 6/60, and left eye, 6/60 on July 12. Right eye: There is now extensive retinal pigmentation scattered over the macular region generally not confined to the central macula. The pigmentation somewhat resembles retinitis pigmentosa. Left eye: The macula remains as a brownish pigmented spot."

regarded all these conditions as similar, differing according to the period in life in which the patient was affected. Scheerer, who has given the latest analysis of the entire subject, emphasized the similarity of the changes in the two eyes, and the frequent resemblance to Haab's senile macular degeneration, an observation which has been made by Behr, Lutz, Pusey and others, although Scheerer is not ready to include senile choroiditis in this group of macular degeneration. In the literature are mentioned the frequent complications with other congenital disturbances, such as color blindness, disturbed light sense and certain anatomic changes in the eye. The pathologic process is unknown, though in this connection the recent work of Pick and Bielschowsky may be mentioned. According to these authors, amaurotic family idiocy is a partial manifestation of a general disturbance of lipoid metabolism affecting the entire body. As to prognosis, the defect is not usually progressive, and the general health remains good.

MARKED EPIBLEPHARON WITH RETROFLECTION OF THE EYELASHES OF BOTH LOWER LIDS IN AN ADULT MONGOLIAN *

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PEKING, CHINA

Epiblepharon, a relatively rare condition in the white race, was first reported by Ammon,[1] in 1841, in the eyes of children. He was also the author of the name for this condition. Since that time, this anomaly, which was recorded by Dimmer [2] in 1885, Bachstez [3] in 1916, Sziklai [4] in 1917, Elschnig [5] in 1922, Hessberg [6] in 1922, Bergmeister [7] in 1923 and Yan Chow [8] in 1925, has been confined to occurrence in the new-born and in children up to 5 years of age, in some cases together with congenital entropion of the lower lid. Meller,[9] in 1917, was the first to call attention to the fact that congenital entropian and epiblepharon, which have, at first glance, so many points of similarity to one another, should not be confused, since these two conditions are altogether different and distinct from each other. Bachstez and Elschnig regarded epiblepharon in the new-born and in young children as a torus of the lower lid overlapping the lid margin and almost entirely covering the eyelashes, which is markedly noticeable on crying and on looking downward. When the epiblepharon is strongly developed, a permanent turning inward of the cilia may be produced. Elschnig stated that usually the normal configuration of the lids takes on shape within the course of a

* Submitted for publication, Oct. 29, 1928.

* From the Department of Ophthalmology of the Peking Union Medical College.

1. Ammon: Der Epicanthus und das Epiblepharon, J. f. Kinderkr., Erlangen, 1841.

2. Dimmer: Epicanthus und Entropium, Klin. Monatsbl. f. Augenh., 1885.

3. Bachstez: Ueber angeborene Faltenbildung am Unterlid—Epiblepharon—mith und ohne Entropium, Klin. Monatsbl. f. Augenh. **57**:372, 1916.

4. Sziklai: Zur Frage des Entropium congenitum, Ztschr. f. Augenh., 1917, vol. 38.

5. Elschnig, A.: Ueber scheinbares Entropium der Neugeborenen, Med. Klin. **18**:498, 1922.

6. Hessberg: Ueber ein angeborenes familiäres Entropium beider Unterlider, Klin. Monatsbl. f. Augenh. **68**:120, 1922.

7. Bergmeister: Temporäre Einwärtskehrung der Zilien der Unterlider, bedingt durch Muskelspasmus ohne Entropium, Ztschr. f. Augenh. **50**:153, 1923.

8. Chow, Yan: Ueber Entropium der Neugeborenen, Klin. Monatsbl. f. Augenh. **75**:162, 1925.

9. Meller: Epiblepharon, Entropium und Trichiasis, Klin. Monatsbl. f. Augenh., 1917, vol. 58.

few weeks or months. He, therefore, considered epiblepharon a temporary malformation during the earliest stage of infancy. From the same clinic, Yan Chow, in 1925, described two similar cases of epicanthus and etropion in children in which the cilia touched the cornea. He said that such touching of the cornea was sometimes unimportant because of the thinness of the eyelashes at that age. Bergmeister's case seen in a boy, aged 5 years, probably does not belong in this same classification.

In some of the ordinary textbooks on ophthalmology, epiblepharon is not even mentioned. This disease also is not referred to in the latest edition of Martin's [10] textbook on anthropology published in 1914.

In 1917, only Herrenschwand [11] reported a case of epiblepharon in a man aged 29. The picture of his case showed much similarity with respect to epiblepharon and trichiasis to that which I shall describe; but there are some points of difference. His case, therefore, constitutes the first case of an epiblepharon occurring in an adult in the literature at my disposal. During the writing of this paper, it happened that I was able to observe in other Mongolians some signs of the same condition, which confirmed my opinion that my case represents probably the last link of a series of physiologic changes of the lower lid found in the Mongolian race, and probably in other races too, with the exception of the Caucasians. Anthropologic set-examinations will be carried out in this direction.

REPORT OF CASE

History.—A well nourished Chinese woman, aged 22, who had always been healthy and had never suffered from any serious diseases, had just given birth to a normal child. The patient was the youngest in a family of eight boys and girls. Her four brothers and three sisters were healthy and well, and did not show any particular signs of trouble in the eyes. She herself had never had any trouble in the eyes.

Examination.—The patient had a round skull, a round face and a low forehead. She had typical "Mongolian eyes," with a slight nasal epicanthus and a slightly oblique position of the palpebral fissure. Her eyebrows were strongly developed and broad. Her nose root was wide, but of the nonsyphilitic type. The upper lips were rather fully developed; other anomalies of the mouth were not noted.

The upper lids of both eyes were normally developed, except that a "covering fold," drooping rather low, as is usual in the Mongolian race, was seen about 3 mm. above the margin of the upper lid. When the gaze was directed upward, still another fold parallel to the margin of the lid was seen about 1.5 mm. above the eyelashes. Although the cilia were numerous in several rows, distichiasis was not present. The eyelashes, which were of the normal length, turn downward and upward. The anterior edge of the upper lid was, perhaps, a little more rounded than normal; the intermarginal strip, however, was of the normal width;

10. Martin: Lehrbuch der Anthropologie, Jena, Gustav Fischer, 1914.

11. Herrenschwand: Ueber Entropium congenitum und Epiblepharon, Klin. Monatsbl. f. Augenh., 1917, vol. 58.

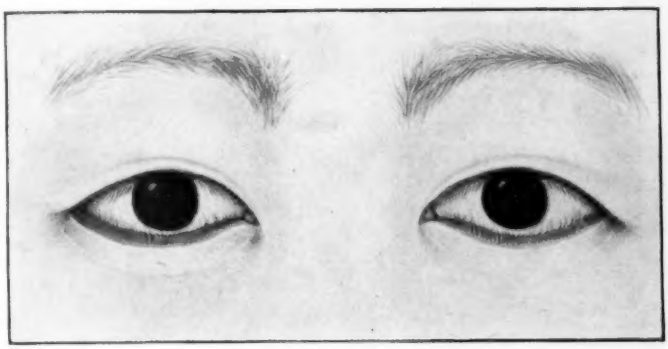

Fig. 1.—Patient looking straight forward: Whitish-yellow line about 6 mm. distant from the anterior edge of the lid. The cilia turn upward and inward and touch the eyeball. Folds are not visible on the lower lid.

UNIV. OF MICH.

the excretory ducts of the meibomian glands were visible in their normal location, and the inner edge of the lid was sharp.

The lower lids of both eyes appeared to have a little less subcutaneous fatty tissue than normal, and, when the patient looked forward, they appeared tighter, almost without any fold. Below the anterior edge of the lid, there ran a sharp, yellowish-white, straight line, slightly elevated, and contrasting somewhat with the rest of the skin which was pink. At first glance, the impression obtained was that of a half moon-shaped scar. This line was farthest away from the margin of the lid, about 6 mm. distant, in the center of the lower lid, which gradually approached the posterior and anterior angles of the lid. Minutely pointed, it disappeared into the normal skin by degrees. The anterior margin of the lid was somewhat sharper than that of the upper lid, the posterior margin being sharp and unchanged. The intermarginal strip was of normal width, and the excretory ducts of the meibomian glands were normally situated.

The cilia (fig. 1) of the lower lids were normal in number and in length, originating from the anterior margin of the lid in one row. When the patient looked straight ahead, they all turned upward, instead of downward, in such a way that the eyelashes next to the anterior angle of the lid pointed upward and slightly inward; at the beginning of the central region, however, they turned directly inward, extensively touching the eyeball conjunctiva and a secant of the cornea at 6 o'clock. In the center of the lower lid one crop of the cilia was pushed to the temporal side, the other to the nasal side; thus, the main point of contact lay nasally and temporally from the vertical meridian of the cornea. The cilia themselves, under the slit lamp, showed evenness, without any changes, gradually ending in a fine point. Split or broken hair was not observed.

The tear puncta occupied their normal places; the tear passages were normally pervious; the patient had never complained of an overflow of tears, and there was not the slightest reflectoric epiphora, in spite of the continuous rubbing of the eyelashes.

The conjunctiva of all four lids was normal; the meibomian glands were clearly visible, and there was not the slightest degree of hyperemia or any secretion.

The bulbar conjunctiva of both eyes was pale, with the exception of a small line-shaped area situated temporarily and downward from 6 o'clock in the right eye, where the cilia continuously adhered; the injection was so moderate, however, that even the patient herself did not notice it. In the left eye where the hairs did not adhere so profusely, only a slight tinge of redness was visible. The rest of the bulbar conjunctiva was pale.

The only roughening of the epithelium, as revealed by the corneal microscope, was a zone, 3 mm. long by 2 mm. wide, next to the lower limbus of the right cornea. Erosion or infiltration, however, was absent.

It is surprising that the sensitiveness of the cornea in the middle of the upper third was not decreased for tactile stimuli. Only the lower third did not feel the touch of a hair or of a piece of cotton. The fact is plain that the sensitiveness of the cornea, almost completely lost there, was caused by the constant irritation of the cilia on this place. Notwithstanding this, the fact may be dwelt on that the sensitiveness of the bulbar conjunctiva near the lower fornix was normal and had been left intact, and that no hypoesthesia was found in any of the three branches of the trigeminus nerve. The rest of the eye was normal.

The position of the cilia just described was found when the eyes looked straight forward. When the patient looked extremely upward, the lower lid was usually separated slightly from the eyeball, but the cilia did not touch either the

conjunctiva of the eyeball or the cornea. In the same position, only two cilia of the right eye came in contact with the region of the plica semilunaris. On the other hand, when the patient looked downward, the cilia turned inward, touching the eyeball both nasally and temporally, but in such a way that the patient did not experience any disagreeable feeling.

COMMENT

The most interesting facts in this case lay in the change of the shape of the lower lids when the patient looked downward, and in the way the lids closed.

When the patient looked downward, not all of the lower lid, together with the eyelashes, dropped downward nor did the palpebral fissure remain open, as in a normal eye; in this case, only that part of the lid which was next to the margin with the cilia was lowered, thereby becoming covered by a tight horizontal skin fold, which came into being when about 10 degrees of the downward movement was completed (fig. 2).

Fig. 2.—Patient looking downward about 10 degrees: A fold of the skin, the "epiblepharon" comes into being at the nasal half, covering just the anterior edge of the lid. The whitish-yellow line stands higher than in figure 1.

When the patient looked extremely downward, the lid margin disappeared entirely behind this fold, which was about 6 mm. in height, leaving the eyelashes partially visible and the palpebral fissure narrower than it should be on the normal downward look, because the skin fold stood much higher than the margin of the lower lid (fig. 3). Careful examination revealed that the previously mentioned sharp, white, half moon-shaped line formed the uppermost margin of this fold. The skin part of the lid, which, when the patient looked staight forward, lay above the curved yellowish-white line, was turned toward the eyeball when she looked downward. When she looked downward, therefore, the upper part of the lower lid, together with the eyelashes, became covered by a skin fold rising from the part beneath it; in other words, the lower part of the lid did not follow the downward movement. From this, it follows that, when the patient looked downward, the eyelashes were forced upward by the skin fold, touching the cornea in this position. When

she looked upward, the covering fold of the upper lid also covered the eyelashes, as in ptosis adiposa.

Another anomaly in this case was the remarkable position of both lids seen when they were closed: the upper lid covered the lower lid in such a way that, contrary to the usual closing in which the upper intermarginal strip fits exactly on the lower one, the posterior margin of the upper lid covered the anterior edge of the lower lid. This gave the impression that the upper lid, normally long in the horizontal direction and curved, covered the too short lower lid. Both lids were, therefore, displaced in the sagittal direction, about the full width of the intermarginal strip.

When one considers the condition as a whole, the anomaly of the lids in this case consisted of the following components: 1. A sharp, half moon-shaped, yellowish-white line in the skin of both lower lids became, when the patient looked downward, the upper port of a fold covering the lid

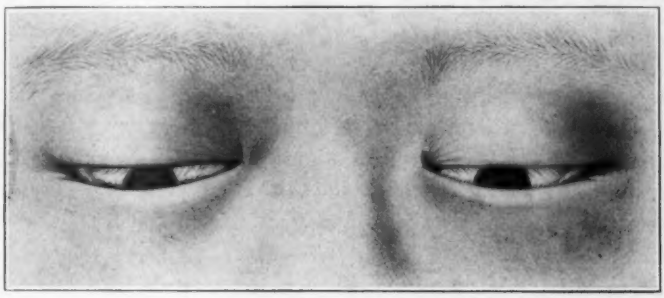

Fig. 3.—Patient looking extremely downward: the entire margin of the lid, together with the cilia, is overlapped by the "epiblepharon fold."

edge of the lower lids as well as the eyelashes. 2. There was an incongruency of the lids in the fact that the lower lid appeared too small in comparison with the upper one, and that it lay on the eyeball more tightly than the upper lid. In consequence of this, when the lids remained lightly closed, the upper lid was seen standing out in front of the lower one, i.e., it was displaced away, in the sagittal direction, a little more than the width of the intermarginal strip. For this reason, the intermarginal strip of both lids did not quite meet on closure. 3. All the eyelashes of the lower lid turned upward and inward to the eyeball, instead of downward and outward. 4. In spite of the fact that the hairs touched the left bulbar conjunctiva and the lower secant of the cornea throughout the entire length the patient did not feel any pain or sensation of a foreign body; in contrast to this, the sensitiveness of the rest of the cornea was quite normal. The patient was entirely unaware of this condition. The rest of the eye was normal, and a similar congenital anomaly was not present anywhere on the body.

The facts (1) that there was not any suspicion of syphilis, either from her history or from the results of the serologic examination of the blood obtained, and (2) that there was not any disease of the conjunctiva which could explain the abnormal direction of the eyelashes, should be emphasized. It may be noted, moreover, that the trachomatous infection, which is common among the Chinese, was never present, since the conjunctiva was absolutely clear and transparent in all its parts.

The question now arises as to whether the four symptoms mentioned were simply coincident, or whether one followed another. The first sign of this disease was probably the peculiar development of the fold situated in the lower lid, which is called an "epiblepharon." It is not impossible to think that the sharp, white line forming always the tip of the elevated fold, when the patient looked downward, was a kind of scar resulting from the skin being most mechanically occupied at this place. Similar white or yellowish lines also occur in some cases at the place where the lower margin of the lid adheres to the bulbar conjunctiva (Elschnig). At the top of such folds, the conjunctiva also loses its transparency in the course of time, and becomes a compact tissue. Whether this line is a fatty degeneration of the skin, in view of the faint yellowish-white color, or whether it is scar tissue, can be determined only by microscopic examination, which, in this case, could not be done for obvious reasons. On the other hand, folds in the external skin are often found without any changes of the skin itself, even in cases in which the folds are marked and acute.

With regard to the second main symptom, the position of the eyelashes, there are two possible explanations: Either the eyelashes of the lower lid had from fetal life grown in the wrong direction and perforated the skin upward and inward (congenital anomaly), or the origin of the eyelashes was normal, whereas the cilia were turned upward by the abnormal "epiblepharon fold" of the lower lid from the time of birth onward in such a way that they retained this direction permanently. At this juncture, however, objection could be raised on the ground that, when the patient looked straight ahead, an epiblepharon fold, which would turn the cilia upward, was not visible. The answer to this is, as is known through the examinations made by Dimmer, Bachstez and Elschnig, who observed epiblepharon folds in the European new-born or in children during the earliest stage of infancy, that these epiblepharon folds producing pseudo-entropian with trichiasis disappear in the course of a few weeks or months. I may, therefore, accept the fact that in my case the constant presence of the epiblepharon fold since shortly after birth or in the first years of life, when the patient gazed straight ahead, was sufficient to have turned the cilia upward, and that the position of the eyelashes remained the same in spite of the gradual diminution of

the epiblepharon in the course of time. The supposition of a congenital change of the cilia has much in its favor, though I consider the cause just mentioned, i.e., the passive dislocation of the eyelashes, and one which will be defined presently, as being more probable. The fact is that the upper lid overlapped the lower lid by a width of the intermarginal space; from which it becomes clear that the eyelashes, which were probably turned upward by the epiblepharon of the lower lid only in a small degree, were totally forced upward by the pressure and weight of the upper lid. Hence, it is comprehensible that the presence of this position of the upper lids during sleep and at every closure of the lids was responsible for the lasting change of the position of the eyelashes. From this point of view, it is necessary to take for granted that the epiblepharon fold of the lower lid turned the cilia upward at the very beginning, but that the overlapping upper lid produced the final position.

On viewing the lids, I considered the upper lid normal and well curved, and the lower lid, adhering more closely to the eyeball than the upper one, a little too small and too short.

The most striking points in the case, at the first examination, were that the patient did not feel the intensive touch of the eyelashes brushing against either the cornea or the bulbar conjunctiva, and that there were not any signs of irritation worthy of mention.

In this case, a slight, hardly visible redness of the right eyeball and a minute roughening of the corneal epithelium were visible only with the help of the corneal microscope. The sensitiveness to touch, at the same time, was normal in the center and the peripheral parts of the rest of the cornea. If the theory of a congenital hypo-esthesia of the lower part of the cornea is refuted, then it is necessary to accept the condition as having for its basis habit, bespeaking a long duration of the disease; for a habit contracted after birth would explain this hypo-esthesia most logically. It is known from daily clinical experience that a trichiasis caused by trachoma, for instance, hurts the eye very much and invariably produces erosions and ulcers of the cornea. It was stated by Dimmer, Bachstez and Bergmeister that in childhood the touch of the cilia also produces the same complications. Bergmeister reported a case of merely temporary trichiasis in a normal healthy boy with normal eyes, which was caused, in his opinion, by a spasmodic contraction of the orbicular muscle, resulting in the development of corneal ulcers produced by the temporary touch of the cilia when turned inward as skin parallel to the margin of the lid.

For the sake of completeness, it may be mentioned that, on forced closure, the covering fold of the lower lid as well as the overlap of the upper lid with the contact of the eyelashes with the eyeball was more pronounced.

The absence of epiphora, i.e., of a reflectoric flow of tears, is a proof of the evident dulness of the ends of the trigeminus nerve both in the cornea and in the bulbar conjunctiva. This fact also embodies the condition existing in the earliest stage of childhood: In the new-born infant, the secretion of tears is either totally or partially missed on account of the undeveloped state of sensitiveness. It follows then that the cornea became accustomed gradually to the touch of the cilia early in life—hence the validity of hyposensitiveness. In this connection, it is not out of place to remark on the physiologic closure of the lids. There is the prevailing opinion that the absolutely exact fitting of both intermarginal strips, one to each other, is necessary for preventing the overflow of the tears over the lid margin oiled by the secretion from the meibomian glands. The case under discussion shows that, even in a complete incongruency of the intermarginal strips, an epiphora does not occur. This may be accounted for by the following two possibilities: either the exact fitting of the margins of the lids, one to the other, is of less importance in the prevention of epiphora, or the secretion of the meibomian glands alone is amply able to effect this. It is remarkable that, in this case, even in increased tear production, for instance by cold or by touch, the tears did not flow over the margin of the lids more readily and freely than they do in people in whom closure of the lids is normal.

There was not any resemblance to the other well known acquired or congenital anomalies of the lid in the condition discussed. The dystrophic conditions of the lids known as blepharochalasis and ptosis adiposa consist of changes of the upper lid, and debility of the external skin of the lid, respectively, each being a relative enlargement, whereas in my case the presence of the skin fold in the lower lid alone, without any consideration of the incongruency of both lids, seemed to show that the condition constituted an entirely distinct group of congenital anomalies.

It may be mentioned that the condition as a whole, including the turning of the cilia inward as well as the characteristic fold in the lower lid, did not show any similarity either to the forced closure of the lids or to the turning of the cilia inward in severe essential or senile blepharospasm. In the two latter named conditions, the skin is primarily laid in many small horizontal running folds by spasmodic contractions of the orbicular muscles, with the result that the whole lid, together with its hairs, is rolled inward like a blind. In my case, however, there was not any evidence of a pathologic contraction of the orbicular muscle, since it was only when the patient looked downward that there was just one large fold.

I agree fully with Meller on the incorrect application of the name "trichiasis" in these cases. This term should be reserved for the condition in which the cilia perforate the skin in a nonphysiologic manner.

In observing the position of the cilia, when the patient is looking downward about 10 degrees, one will see in a patient with epiblepharon that the cilia are mechanically elevated by the folds of the epiblepharon; in reality, they are lying on this skin fold horizontally; and when the patient looks extremely downward the epiblepharon only turns the cilia completely upward and even inward against the eyeball, the cilia having the appearance of being retroflected. I should like, therefore, to propose the application of the term "elevation of the eyelashes" (elevatio ciliorum) as the first degree and "retroflection" ((retroflexio ciliorum) as the second degree. The term "trichiasis" should not be used in these cases.

In my case of epiblepharon, operation was unnecessary, since there was not any ulceration of the cornea; furthermore, the patient did not feel the touch of the hairs. The conditions of other patients with the same anomaly whom I have observed in the meanwhile endorse this opinion. Further observations in this direction are necessary, however, to prove the suppositions.

The mechanism of the formation of this epiblepharon fold will be discussed in a later paper.

SUMMARY

1. When the patient looked downward, a marked skin fold of the lower lid, a so-called epiblepharon, came into being, which covered the margin of the lid and the cilia, giving the appearance of a pseudo-entropion. With this fold, the width of the palpebral fissure became smaller than normal.

2. There was a thin whitish-yellow line in the skin of both lower lids, about 6 mm. distant from the lower margin of the lid.

3. The cilia of both lower lids turned upward and inward (retroflexio ciliorum) and touched the cornea.

4. In spite of the permanent touch of the cilia, there was not any ulceration of the cornea, and the normal sensitiveness of the rest of the cornea was intact.

5. As far as these examinations are concerned, I have the impression that one of the most characteristic signs of the Mongolian lid fold, besides the epicanthus, is the presence of a more or less developed epiblepharon. Further investigations will prove this supposition.

THE PRERETINAL ARTERY

AN ANATOMIC STUDY *

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Since Liebreich's [1] description in 1871 of an aberrant retinal vessel in the human vitreous, this anomaly has been reported about thirty-two times. The terms prepapillary or preretinal artery and vascular or spiral loop in the vitreous have been used interchangeably to denote an apparently patulous vessel in the form of a variously shaped loop, more often artery than vein, having its origin and termination in the disk or its immediate vicinity and projecting for a variable distance into the vitreous.

After Friedrich Müller's classic description of the persistent hyaloid artery in 1856 and of its microscopic structure ten years later by Meissner, there followed abundant reports, not only of its significance, but of blood-containing vessels in various parts of its course. The accepted notion of the hyaloid system included the presence of both artery and vein. In his case, Liebreich saw an arterial loop on the disk which appeared to connect with a retinal vein. It was natural, then, for him to state: "The emerging loop is the hyaloid artery, the other portion the hyaloid vein." Schapringer [2] and Kipp,[3] in 1874, spoke of the loops in their cases as merely hyaloid arteries, although it is not clear whether they disregarded the existence of a hyaloid vein.

In 1885, Hirschberg,[4] fresh from studies of the retinal circulation in lower vertebrates, stressed the independence of the loop from the embryonal circulation or its remains. This conclusion [5] was suggested to him particularly through a study of the eyeground of the bleak, a Central European river fish, in which a whole series of arteries radiates from the disk into the vitreous. Frost [6] appears to have accepted Hirschberg's view in describing "an abnormal course of a branch of

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* From the Laboratories and Ophthalmological Division of the Mt. Sinai Hospital.

1. Liebreich: Tr. Path. Soc, London **22**:221, 1871.
2. Schapringer: Arch. f. Augenh. u. Ohrenh. **3**:146, 1874.
3. Kipp: Arch. f. Augenh. u. Ohrenh. **3**:190, 1874.
4. Hirschberg: Centralbl. f. prakt. Augenh. **9**:205, 1885.
5. Hirschberg: Arch. f. physiol., 1882, p. 519.
6. Frost: Ophth. Soc. U. Kingdom **7**:175, 1887.

the arteria centralis retinae," but several authors continued to interpret the loop as a hyaloid artery; others, even as late as 1903, referred to the hyaloid vein, notwithstanding conclusive evidence of the nonexistence of the latter structure. The distinction of the loop from the hyaloid

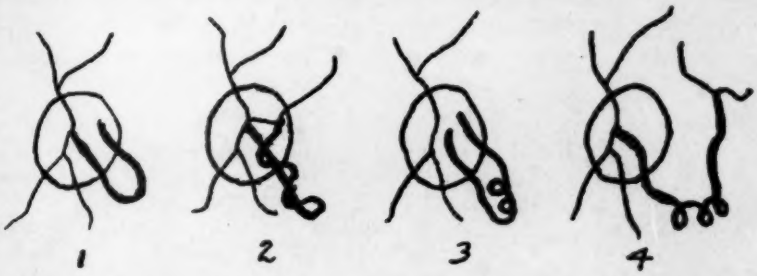

Fig. 1.—Diagram of prepapillary loops according to Leber's classification.

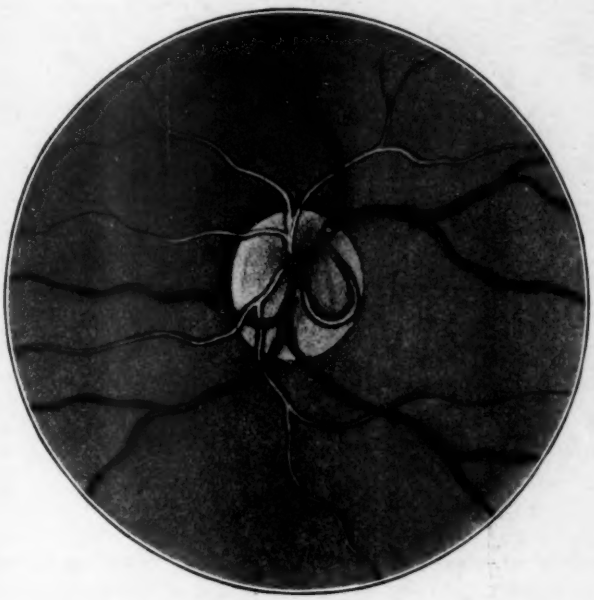

Fig. 2.—Preretinal artery of left eye.

artery was once more pointed out by Günsberg [7] in 1899, and later by Kipp [8] and Von Hippel.[9] The latter noted their comparability to tor-

7. Günsberg: Klin. Monatsbl. f. Augenh., 1899, p. 173.

8. Kipp: Arch. f. Ophth. **34**:256, 1905.

9. Von Hippel: Graefe-Saemisch Handbuch der gesemten Augenheilkunde, 1910, vol. 2, p. 72.

tuous vessels in the retina and distinguished the small loop from the large one which was apt to form many spiral turns in the vitreous. Leber,[10] in reviewing twenty-five collected case reports, further emphasized the origin of the loop from the retinal circulation. In 1924, Merrill and Wagener [11] reviewed five additional cases, adding their own of spiral looping of a retinal vein.

Fig. 3 (section 1).—The central retinal artery *CRA* is cut longitudinally; *CRV* indicates the central retinal vein; *A*, nasal branch of central artery; *C*, distribution of nasal branch into retina and *B*, temporal limb of preretinal artery.

All but four of the loops reported were arterial; in four cases the arterial loops were bilateral, while in one case, that of Nomura,[12]

10. Leber: Graefe-Saemisch Handbuch der gesemten Augenheilkunde, 1915, vol. 7, p. 72.

11. Merill and Wagener: Am. J. Ophth. **7**:177, 1924.

12. Nomura: Abstr., Ophth. Year Book, 1914.

distinct loops came from both the central artery and the central vein in the same eye.

On the basis of the point of origin of the emerging and the site of termination of the returning limb, Leber distinguished two types of loops: one having both points in the disk, the other having one point in the disk and the other in the retina. Obviously, the distinction between emerging and returning limbs is artificial, except perhaps in the case

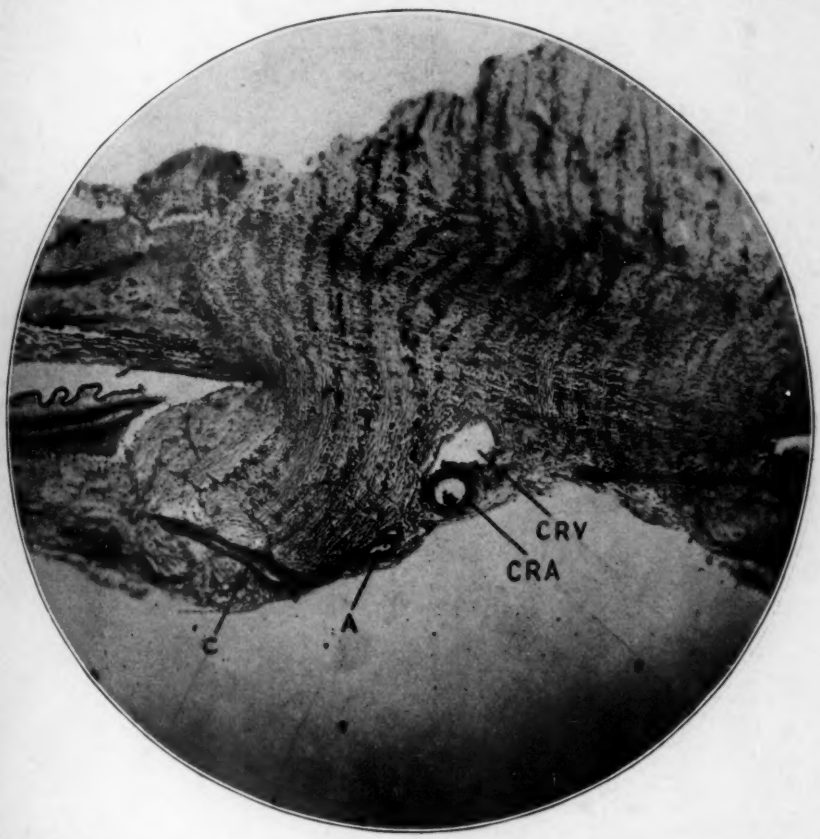

Fig. 4 (section 2).—In the pit of the disk are the central retinal artery *CRA*, with the vein, *CRV*, above it. *A* indicates the nasal branch of the central artery; *C*, the distribution of the nasal branch into the retina, and *B*, the temporal limb of the preretinal artery.

of a vein coming from the retina and emptying into a venous trunk on the disk. In the first group, which comprises by far the greater number of reported cases, further division may be made according to whether the limbs of the loop are connected with vessels on the disk (the more usual occurrence) or whether they pierce the disk itself without visible

connection with a vessel (numbers 1, 2 and 3 of figure 1). There is no case in which the loop was found in association with the retina alone.

Our conception of the structure of the prepapillary loop has been built up from various appearances in different cases. That it is a patulous, blood-containing vessel is established from its spontaneous pulsation in some cases and the fact that in others pulsation was induced by pressure on the globe. Of interest are the strands of tissue, often

Fig. 5 (section 3).—Nasal cross-section of the central retinal artery *CRA*; *CRV* indicates the central retinal vein; *P*, the preretinal artery; *V*, the vitreous; *T*, the temporal branch of the central artery and *D*, the wall of the temporal branch of the central artery.

glistening, joining the loop with the papilla and apparently serving as a support for the vessel in the vitreous. The suggestion has been offered that such glistening is due to the increased prominence of the outer vessel wall in the absence of overlying retina. Merrill and Wagener suggested that the tissue may be remnants of the connective tissue about the hyaloid, or that it may be the internal limiting membrane pushed ahead

by the vessel or even a portion of the nerve fiber layer. Regarding the relation of the vessel to these structures, they stated: "So far as can be ascertained, no anatomic investigation has been made; therefore, the exact nature of the structure and processes involved must be a matter of conjecture only."

It was our good fortune to observe a short prepapillary arterial loop clinically and to be able to present the first study of this anomaly in microscopic section.

Fig. 6 (section 4).—Greater detail of origin of nasal limb of preretinal artery, *P; B,* temporal limb of preretinal artery; *A,* nasal branch of central artery; *T,* temporal branch of central artery; *OA,* opening into nasal branch; *OP,* opening into preretinal artery; *C,* retinal distribution of nasal artery and *D,* wall of temporal branch of central artery.

REPORT OF STUDY

Clinical Description.—A Porto Rican girl, aged 2½ years, was one of two sisters stricken with tuberculous meningitis. During a search for tubercles, a short prepapillary loop was seen in the left eye, apparently arising from the main

trunk of the artery in the pit and forming an oblique loop temporally, so that the turn was vertical and the upper limb pierced the disk somewhat above the level of the pit. The loop reached 4 diopters into the vitreous, glistened and did not pulsate, but gentle pressure on the globe elicited definite pulsation. A similar anomaly was not seen in the right eye.

After death, about eighty sections of the nerve head were prepared serially, and an attempt made to reconstruct the loop from its origin in the pit to its termi-

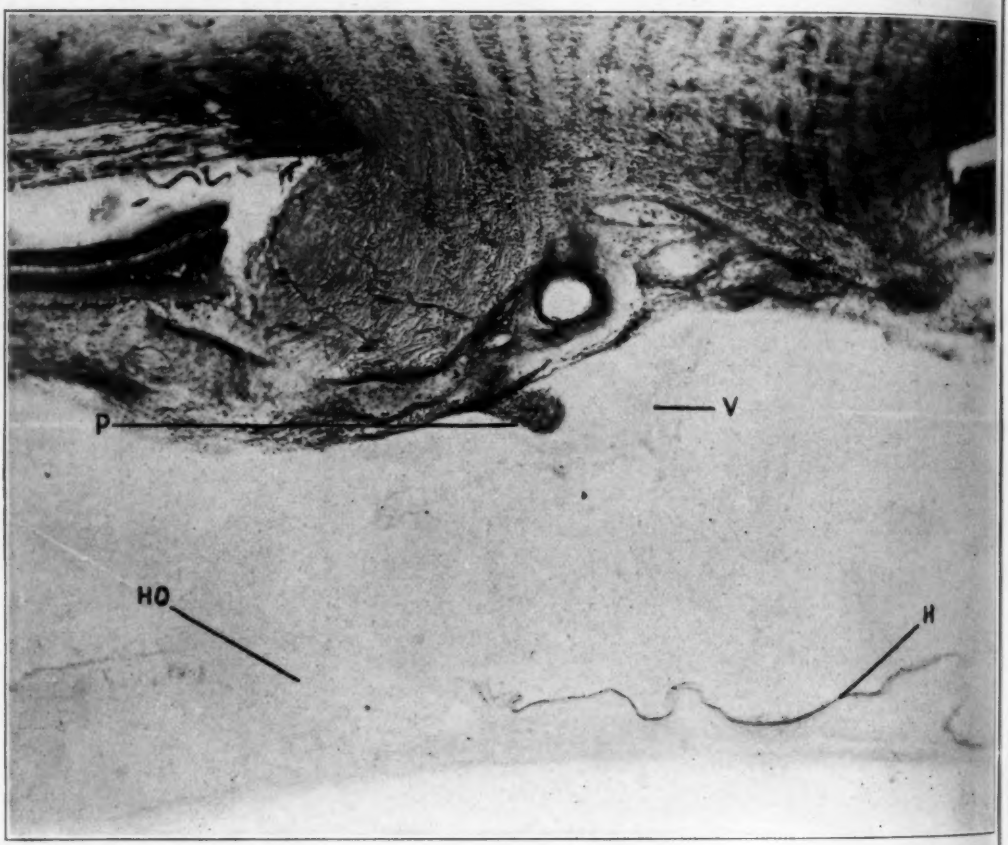

Fig. 7 (section 5).—*P* indicates the preretinal artery; *V*, the vitreous; *H*, the hyaloid and *HO*, the hole in the hyaloid.

nation in the temporal part of the nerve head. Five sections are presented in order and follow as closely as possible the course from the origin of the loop nasally to its termination temporarily in the disk. As the latter is higher than the nasal origin, the last two sections are taken at a higher level than the first. Many intermediate sections were discarded as not having great importance in building up the loop.

Microscopic Description.—In section 1 (fig. 3), the central retinal artery *CRA* is cut longitudinally. Temporally and close to it is a horizontally oval section of the central retinal vein, *CRV*. Coming off the central artery is the open nasal

branch, *A*. Vessel *C* is the distribution of the nasal branch in the retina. At *B* are a few fibers of the temporal limb of the preretinal artery jutting into the vitreous.

In section 2 (fig. 4), in the pit of the disk are the central artery *CRA*, with the vein *CRV* above it. *A* is the nasal branch of the central artery; *C* is its retinal distribution. At *B* is the temporal limb of the preretinal artery entering the nerve tissue.

Fig. 8 (section 6).—Artefact in hyaloid membrane, *HO*. *P* is the preretinal artery, and *B*, beginning of temporal limb of preretinal artery.

Section 3 (fig. 5), nasally, is the cross-section of the central artery *CRA*. At its nasal side is a section of the wall of its nasal branch which divides into the preretinal artery and the nasal distribution into the retina. The preretinal artery juts into a faintly staining acellular substance, in all probability the vitreous, *V*. No definite thickening of the latter or of any membrane can be demonstrated about the vessel. Temporally is the central vein *CRV;* immediately above it is the open temporal section, *T*, of the central artery from which a longitudinally cut band of tissue, *D*, representing its wall, continues down and outward, to meet the temporal limb of the preretinal artery, which is seen to project slightly into the vitreous. The temporal branch thereupon continues its distribution into the retina.

Section 4 (fig. 6) shows in greater detail the origin of the nasal limb *P* and the temporal limb *B*, of the preretinal artery from the nasal branch *A* and the temporal branch *T* of the central artery, respectively. In addition, three openings at the site of the nasal bifurcation are more clearly seen: The two temporal, *OA*, mark an opening in the nasal trunk; the smaller nasal one, *OP*, an opening into the preretinal artery. *C* is the nasal retinal distribution.

Section 5 (fig. 7) is designed to show the vitreous with its denser outer portion, the hyaloid, *H*, and a hole, *HO*, in the latter. The missing vitreous corresponding

Fig. 9 (section 7).—*OP* is the enlarged opening described under figure 6. *OA* is the opening into the nasal branch of the central artery; *T*, the open temporal branch of the central artery; *P*, preretinal artery and *B*, beginning of the temporal limb of the preretinal artery.

to this hole (an artefact) surrounds a section of the nasal limb of the preretinal artery.

In section 6 (fig. 8) the artefact in the hyaloid membrane is seen. The missing vitreous now surrounds both the first and second portions of the preretinal artery *P*. At *B* is seen the beginning of the temporal limb of the preretinal artery.

In section 7 (fig. 9) *OP* is the enlarged opening described in section 4. It represents the opening into the nasal limb of the preretinal artery. *OA* is the

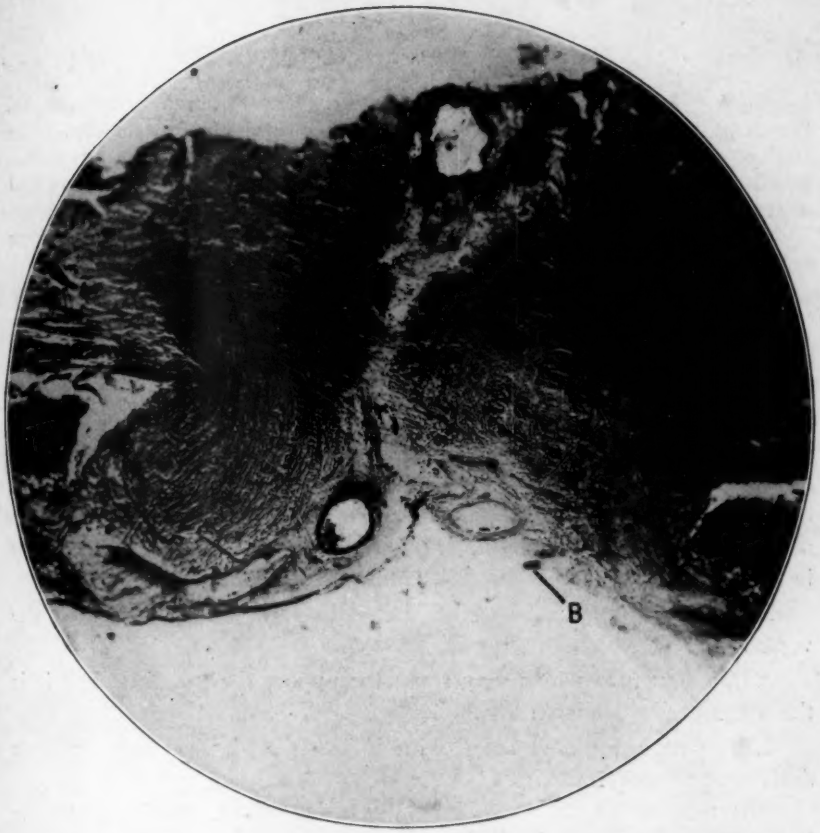

Fig. 10 (section 8).—*B* indicates the projecting temporal limb of the preretinal artery.

Fig. 11.—Composite photograph of preretinal artery as established in successive sections.

opening in the nasal branch of the central artery. *T* is the lumen of the temporal branch of the central artery corresponding to the band of tissue marked *D* in section 4. *P* represents almost the completed section of the preretinal artery coursing through the vitreous. *B* is the beginning of the temporal limb of the preretinal artery.

In section 8 (fig. 10), the temporal limbs of the preretinal artery in two oblong sections, projecting into the vitreous and devoid of covering, are shown.

SUMMARY

The following anatomic facts are established regarding the prepapillary retinal artery in this case:

1. The demonstration of the connection of its points of origin and termination with branches of the central artery establishes the artery as merely a preretinal loop in the retinal circulation. The failure to demonstrate a lumen with blood cells in the loop, except perhaps at its nasal origin, does not detract from this conclusion. Such a failure may be due to technical difficulties in preparing the sections.

2. There is no membrane or sheath in intimate contact with the vessel.

3. No structure which may serve to support the vessel, unless it is the vitreous, is demonstrated.

4. The loop does not carry with it into the vitreous any elements derived from the retina.

The relation of the hyaloid or internal limiting membrane to the loop is not clearly established. From the presence of a hole in the hyaloid membrane and in the vitreous about the loop, it may be adduced that the latter pierces the hyaloid to enter the vitreous. However, the possibility that the hyaloid has been merely pushed ahead to produce, in effect, a lining membrane, thus shutting off the vessel from the vitreous, cannot be definitely precluded.

CATARACT IN MYOTONIC DYSTROPHY*

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OMAHA

Myotonic dystrophy, dystrophia myotonica or myotonia atrophica was first identified as a clinical entity in 1890. Several observers recognized the difference from myotonia congenita or Thomsen's disease. This condition of familial type has the isolated disturbance in muscle function seen in myotonia, namely, an excessive contractility and a lessened relaxation of muscle. The recognition of a distinct group of cases showing a peculiar distribution of muscle atrophy associated with varying degrees of myotonia led to the establishing of a separate clinical disease.

By 1909, other characteristic features of the disease had been discovered: the characteristic hollow cheeked myopathic facies, the result of atrophic changes in the muscles supplied by the trigeminal nerve, and atrophy of the sternocleidomastoid muscles and those of the forearm and peronei groups. Besides this muscle dystrophy, widespread dystrophic changes, such as cataract, gonadal atrophy and sterility, baldness and general loss of body weight, were found to be constantly present in other organs. Fleischer next proved another cardinal point in the disease, namely, a familial tendency.

In slightly more than 200 cases reported to date, the prominent clinical features are as follows: The majority of patients have shown an onset of symptoms between the ages of 20 and 30. The disease is slowly progressive, practically all patients dying of secondary disease before the age of 45. The myotonia is at times widespread and affects the muscles generally. It is most characteristically present in the hand grips. The inability to relax is greatest when the patient is cold or under emotional tension. Asking the patient voluntarily to contract any set of muscles affected brings out the myotonia in attempted relaxation. At times it is pronounced in chewing, the patient being unable to relax the jaws. When myotonia is present in the legs, the patient falls at times. Percussion brings out the myotonia in atrophic muscles, particularly in the tongue, and in the thenar and hypothenar eminences. Faradic stimulation also produces the phenomena.

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The muscular atrophy usually appears first in the facial and masticatory group, and next in the sternocleidomastoids and forearm group; the vasti groups in the thighs and the dorsiflexors are likewise affected. Fibrillary twitchings are not present in the atrophied muscles, and while the reflexes are lost late in the disease, this is secondary to changes in the muscles themselves. The patient's gait is on a wide base and appears weak, at times of the steppage type. The speech is of a low, nasal type because of the atrophic masticatory, facial and palatal muscles.

Mental changes are usually present; often the patients are intellectually retarded, unsociable, unreliable, selfish and suspicious.

The etiology is as obscure as the cause of the other primary dystrophies and spinal atrophies. There is unquestionably a congenital abiotrophy, and the disease belongs in the heredofamilial group along with Huntington's chorea, Thomsen's disease and others. There is good clinical evidence pointing to a primary pluriglandular defect.

The pathologic changes are yet to be determined in this disease, as only a few necropsies have been obtained. Proved lesions have not been found in the central nervous system. A few observations of degenerative changes in the endocrine glands have been reported. Numerous reports of biopsy studies of the atrophic muscles appear in the literature. A characteristic microscopic picture is seen in the formation of long chains of sarcolemma nuclei in the muscle fibers.

Isolated cases of the occurrence of cataract in myotonic dystrophy were reported in 1911 by Hirschfeld, Greenfield, Ormond, and Kennedy and Oberndorff. In 1912, Hoffman [1] reported four cases of myotonic dystrophy with presenile cataract and described the occurrence of both in several members of a family, other members of which showed either condition alone. He estimated that cataract occurs in 10 per cent of the cases of myotonic dystrophy. Curschmann, in 1912, recognized cataract as an important symptom associated with the disease. Löhlein [2] saw a woman, aged 29, with cataract who likewise showed a peculiar yellowish discoloration of the nerves and scotoma. It was only in the course of a physical examination to determine the cause of the cataract that she was found to have myotonic dystrophy in an early stage.

In 1918, Fleischer [3] collected the previously reported cases and had all patients with presenile cataract in the Tübingen clinic for a number of years examined neurologically. He found among these patients no less than 38 cases of myotonic dystrophy. Twenty-eight of these were in families showing other cases of myotonic dystrophy, and four other patients gave a history of presenile cataract in the family. In eleven

1. Hoffman: Am. J. Ophth. **81:** 512, 1912.
2. Löhlein: Klin. Monatsbl. f. Augenh. **52:**453, 1914.
3. Fleischer, Am. J. Ophth. **96:**91, 1918

cases, one or both parents had been operated on for cataract, usually of the presenile type. While Fleischer did not record a slit-lamp examination in his cases, he described the typical cataract in myotonic dystrophy as beginning at the posterior pole with lines radiating out from the center, punctate opacities later developing in all layers of the cortex. He distinguished between this form of cataract and the cataract seen in tetany, which begins around the nucleus like a lamellar cataract. He believed, however, that cataract and some of the other symptoms of the disease are due to a deficiency of internal secretion, which may be the cause of the myotonia or only the result of some underlying cause.

Hauptmann [4] also believed the whole syndrome to be a complex due to disturbances of internal secretion. He summarized the symptoms in a number of cases seen in Freiburg and gave a slit-lamp picture of one patient examined by von Szily which showed the typical star-shaped opacity in the posterior cortex with small punctate opacities in all layers of the lens. One of his cases also showed pallor of the disks.

Schmidt [5] reported two families with myotonia and cataract, several members of which had cataract alone.

Vogt [6] made the most careful study of the cataract in myotonic dystrophy. He studied a number of cases with the slit-lamp and found that in early stages the changes in the lens are absolutely typical of myotonic dystrophy. While the posterior stellate opacities described by Fleischer are often seen, they may be absent in early stages and are seen in other conditions. What is absolutely characteristic is the occurrence of a mixture of shiny flakes, white dots and fine, dustlike opacities in a sharply defined layer just under the anterior and posterior capsules. These flakes show the play of green and blue characteristic of cholesterol crystals, and in one extracted lens which was examined chemically a marked reaction for cholesterol was obtained. These opacities were seen in a number of patients who had not noted any visual disturbance. They were found in all the patients whom Vogt examined, and he believed that slit-lamp examination would probably show them in all cases of myotonia, the 10 per cent incidence reported by Hoffman representing only relatively advanced cases. This condition, as seen in three cases, is well pictured in Vogt's Atlas (p. 275). Vogt believed that opacities of the lens are to be found more frequently than the muscular symptoms in families with myotonia (p. 225). In 1922 he had seen five families, and believed that mild forms of the condition often pass unrecognized.

In 1922, Lüssi [7] reported a case showing the typical slit-lamp picture, which led to the first correct diagnosis of the condition.

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4. Hauptmann: Klin. Monatsbl. f. Augenh. **60**:576, 1918.
5. Schmidt: Ztschr. f. Augenh. **41**:199, 1919.
6. Vogt: Klin. Monatsbl. f. Augenh. **72**:421, 1924.
7. Lüssi: Schweiz. med. Wchnschr. **52**:796, 1922.

In 1924, Abe [8] reported from Japan two cases in a brother and sister, both showing cataract.

In 1925, Heine [9] reported ten cases. One mother showed the typical subcapsular points and flakes, while her son showed a posterior stellate opacity. Two brothers included in his series had the allied condition, Thomsen's familial hypertrophic muscular dystrophy. Although having normal vision, on slit-lamp examination, both showed typical subcapsular opacities. Of his ten patients, the changes in the lens are described as nuclear in one, subcapsular in five, total in one, posterior cortical in two and posterior stellate in one. Details are not given, and it is not stated if all were examined with the slit-lamp.

Aside from Heine's cases, the only other report of cataract in a person with Thomsen's disease is by Gronholm.[10] In one eye the cataract was mature; in the other posterior cortical opacity with white points in the anterior cortex was present. Gronholm also reported another case showing typical myotonia.

Weil and Nordmann [11] discussed the condition, which they have not found in Strasburg. They described a form of change in the lens with dots and precipitates through the cortex seen in mongolian idiots, which resembles the changes in myotonia more closely than any other type of cataract. These have also been described by van der Scheer,[12] who noted the probable resemblance of the changes seen in his cases to those described in myotonia. While with ordinary oblique illumination the two conditions may be considered similar, the slit-lamp picture in myotonia is different from that described in mongolian idiocy by Koby [13] and borne out by the details in van der Scheer's cases. In these the opacities extend from the fetal nucleus to the surface of the lens. Y-shaped opacities corresponding to the embryonal sutures were seen by van der Scheer, though Koby did not find them. This points to the beginning of changes in the lens at a much earlier age in persons with mongolian idiocy than in those with myotonia, though possibly, as Koby suggests, the two conditions are both due to a derangement of internal secretion.

We have recently seen a boy of 7 without signs of mongolian idiocy but with cataracts evidently much like those in van der Scheer's cases. They were located deeper in the lens than in myotonic dystrophy, showed greater density along the cortical suture lines and included points and iridescent flakes.

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8. Abe: Japan M. World **11**:18 (Jan.) 1923.
9. Heine: Ztschr. f. Augenh. **55**:1, 1925.
10. Gronholm: Acta Ophth. **5**:166, 1927.
11. Weil and Nordmann: Ann. d' Ocul. **163**:40, 1926.
12. Van der Scheer: Klin. Monatsbl. f. Augenh. **72**:155, 1919.
13. Koby: Rev. gén. d'opht. **38**:365, 1924.

The typical slit-lamp picture described by Vogt was seen by Foix and Lagrange [14] in a case. They examined patients with other types of muscular dystrophy without finding cataract and expressed the belief that it is peculiar to the myotonic type. Scheffels [15] reported two cases showing the typical picture seen with the slit-lamp. One case was in a member of a family in which there were other cases of myotonia and cataract, while in the other there was no evidence of heredity.

Kyrieleis [16] reported a case presenting posterior stellate cataracts in a family showing other cases of myotonia and cataract. One case in this family was unusual in that the disease had occurred at about the time of the menopause and that the patient had reached the age of 71. She had been blind from cataract for ten years.

Although a number of neurologic reports from America and England mention this occurrence of cataract in their patients with myotonic dystrophy, the only account of the condition which we have found in the British or American ophthalmologic literature is that of the neurologist Adie,[17] who abstracts most of the ophthalmologic observations previously reported. Having seen twenty cases in London during six years, he, like Vogt, emphasized the unexpected frequency of the condition when once it is recognized.

REPORT OF CASES

During the past two years, we have seen four cases of myotonic dystrophy, all of which showed changes in the lens.

CASE 1.—Mrs. S., aged 45, referred by Dr. Warren Thompson, had noted muscular weakness, beginning with bilateral ptosis, for fifteen years, and failing vision for the past five years. Several examinations, including the Wassermann test, gave negative results except for the neurologic symptoms and changes in the lens. A marked weakness and flabbiness of most of the muscles were present, affecting most markedly the facial muscles, pectoral muscles and especially the psoas and quadriceps extensors, so that great difficulty was experienced in climbing stairs. The only muscles showing marked atrophy were the sternocleidomastoids, which were reduced to thin bands. Percussion over the affected muscles produced a contraction lasting from thirty to sixty seconds. Distinct myotonia was present in the muscles used in gripping in both hands, and there was a history of difficulty in opening the jaws after closing them.

Ophthalmologic examination showed bilateral ptosis, one fifth of either pupil being covered by the lids. Vision in the right eye was 20/40 and in the left eye 20/50. Eighteen months later vision was reduced to right, 20/50-2 and left, hand movements. In the left eye an almost mature cataract resembling ordinary senile cataract was present. In the right eye the slit-lamp showed a thin layer of opacities under the anterior and posterior capsules. These consisted of a mixture of white dots with shiny flakes or crystals giving the characteristic play

14. Foix and Lagrange: Ann. d'ocul. **162**:637, 1925.
15. Scheffels: Klin. Monatsbl. f. Augenh. **74**:512, 1925.
16. Kyrieleis: Klin. Monatsbl. f. Augenh. **74**:404, 1925.
17. Adie: Brit. J. Ophth. **8**:497, 1924.

of green and blue colors shown by cholesterol crystals. This patient's family history was unimportant, except for the presence of some visual disturbance in a sister, the nature of which was unknown. In this case the occurrence of ptosis as the first symptom is unusual, and the picture might well suggest myasthenia gravis, if it were not for the myotonia, the atrophy of the sternomastoids and the characteristic changes in the lens shown by the slit-lamp.

CASE 2.—Mrs. L., aged 43, gave an essentially unimportant family history except that the mother died of an obscure illness at 46. The patient's past history was unimportant except for influenza in 1919, at which time spontaneous abortion of a six months' fetus occurred. Following this, weakness began in both ankles and gradually progressed. About 1926, weakness began in both hands. Following a tonsillectomy and dental extractions this weakness seemed slightly improved. The patient did not have any other complaints.

Neurologic examination revealed the following: myopathic facies with atrophy and weakness of the masticatory and facial muscles, marked weakness and atrophy of the sternocleidomastoids and weakness of the trapezii. The muscles of the forearm, particularly the extensors and those of the hand, were atrophic and weak. Myotonia was demonstrable in the hand grips. Bilateral dropfoot and atrophy of the peroneal muscles were present. The arm tendon reflexes and the achilles reflexes were not elicited, but the patellar reflexes were sluggishly present.

Slit-lamp examination showed numerous opacities of the lens, which produced a veil-like appearance in the cortex just under the anterior and posterior capsules. These consisted primarily of fine dustlike opacities with some slightly larger white ones, some round and some flakelike. Some of the larger ones were fluorescent, being strikingly reddish and greenish like cholesterol crystals. There was more involvement of the deeper areas of the cortex in the anterior and posterior parts and also of the deep equatorial cortex where the opacities had a tendency to be larger than in other involved areas. These showed a greater density around the posterior cortical suture lines, giving a characteristic stellate appearance (figs. 1 and 2). Vision in the right eye was 20/30, and in the left, 20/40.

CASE 3.—Lucille L., daughter of the patient in case 2, aged 18 years, had acute interstitial nephritis at 3 years of age. Progress in school was normal until she reached the fourth grade, but after that she did not progress mentally. At about the time of the onset of the menses, when the patient was 13, the left foot began to weaken and dropfoot developed. Within a few months a similar condition developed in the right foot and leg. A slight weakness of both hands gradually developed. Otherwise, the patient felt physically normal.

Examination disclosed a fairly normal physical status. The facies were myopathic, with weakness of the masseters and temporal muscles. The sternocleidomastoids were weak and atrophic. A uniform slight atrophy and weakness were demonstrable in the hands and forearms. Myotonia was present in the right hand only. Bilateral dropfoot was present; the right leg was more atrophic than the left. The arm tendon reflexes were not obtained; the patellar reflexes were active; the right achilles reflex was normal but the left was absent. Disturbance in sensation or other pathologic phenomena were not present.

Slit-lamp examination showed peripheral opacities, some of them fine and some of them larger. Some of the larger ones were considerably larger than those seen in the mother's eyes and were more of the coronary type, in regard to both size and location. These opacities were located in the cortex close to the capsule and were more dense and extended a little deeper into the cortex in the posterior part of the lens. At times they showed a certain amount of fluorescence. The

involvement in the daughter's eyes was less marked than in the mother's, the opacities not being so dense or extending quite so deeply into the cortex. Vision was 20/20 in each eye. No other cases of the disease or of cataract are known to have occurred in this family.

CASE 4.—A. M., a man, aged 35, was first examined in January, 1926. The chief complaints were aching pains in the legs and body, with weakness and twitching of the muscles, unstable gait and partial blindness of the left eye. During army service in 1921, the patient first noticed the weakness of the legs. At the same time vision in the left eye began to fail. Muscle weakness progressed in

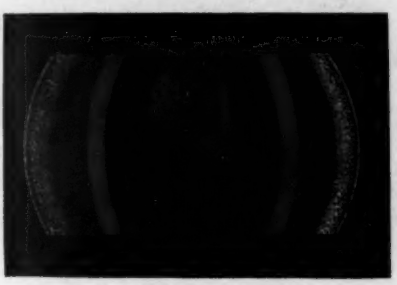

Fig. 1 (case 2).—Optical section of lens seen with the small bundle.

Fig. 2 (case 2).—Posterior cortex.

the legs and affected both arms. About two years before examination, aching pains began in the legs. Muscular twitchings appeared recently in the face and legs. A short time before a neurologist told the patient that the disease was a primary progressive muscular atrophy of spinal origin. The past history was unimportant. In the family history, the patient's brother had had a similar type of atrophy for the past five years. Another brother committed suicide.

Examination revealed the following important signs: generalized emaciation, about 50 pounds (22.7 Kg.) loss in weight, thin facies, pseudoptosis and advanced cataract of the left eye. Marked atrophy and weakness of the muscles of the fifth nerve were present; the sternocleidomastoids and shoulder groups were weak and atrophic. The muscles of the tongue were slightly atrophic. The arms and

hands were atrophic and weak, and myotonia was present. The arm reflexes were absent; marked atrophy and weakness of the calves and the anterior tibial groups were present. The ankle and patellar reflexes were absent. Laboratory studies including examinations of the spinal fluid, gave essentially negative results.

Ophthalmologic examination showed vision in the right eye, 20/20, and in the left eye, hand movements with good projection. The left eye showed a mature cataract with a somewhat brownish nucleus. The right eye showed a layer of opacities best seen with the slit-lamp. These were just under the anterior and

Fig. 3 (case 4).—Optical section of lens. The layer of opacities comes closer to the capsule than in case 2.

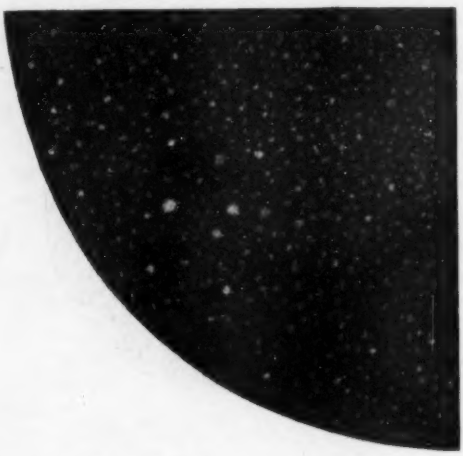

Fig. 4 (case 4).—Anterior cortex.

posterior capsules, composed of dots and flakes, giving a play of colors and resembled in every way those seen in the right eye in case 1. Inside of the thin layer, the lens was normal (figs. 3 and 4).

This patient had been receiving 10 per cent disability rating by the U. S. Veteran's Bureau on the basis of cataract. As a result of the diagnosis of myotonic dystrophy producing the cataract, the patient was sent to the diagnostic center in Cincinnati for further study. A report from Dr. H. H. Hoppe, neurologist in chief, confirmed the diagnosis after exhaustive study. The patient has not returned for operation on the left eye.

Biopsy examination was made by W. A. Willard, professor of nervous anatomy, University of Nebraska, who reported that the section illustrated in figure 5 was a transverse frozen section of a portion of the anterior tibial muscle taken by biopsy and stained with hematoxylin and congo red. There was an increase of the connective tissue, extreme variation in size of the fibers, and a great increase in the number of nuclei and the distribution of nuclei throughout the fiber. The dark masses were clusters of nuclei in degenerated fibers. Figure 6 shows a longitudinal section of the same muscle, the long segmented nuclear rods and the well marked striations of the functional fibers should be noted; the elongate dark masses represent the nuclear clusters in degenerated fibers referred to in the description of figure 5. The lighter areas between the fibers were areas of degeneration.

Measurements of fibers indicated that while there was pronounced atrophy in many fibers, the large fibers exceeded the size described for normal muscle. There

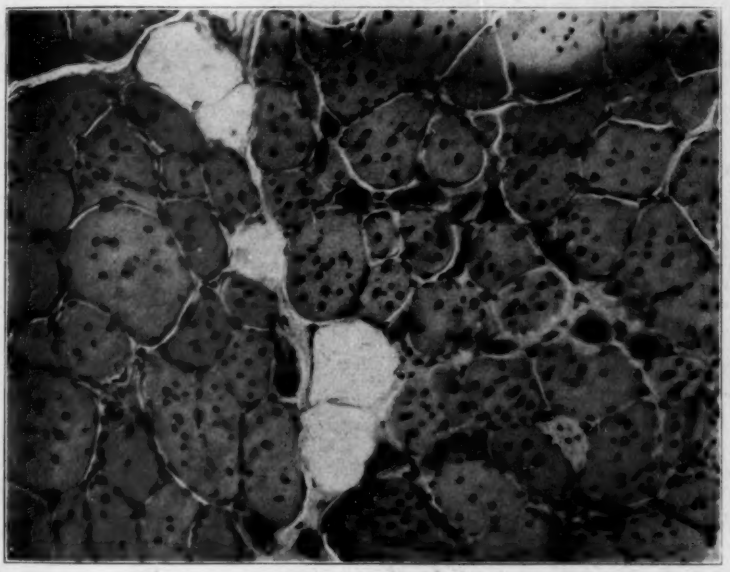

Fig. 5 (case 4).—Transverse section of anterior tibial muscle; × 175.

was no uniformity in the character of nuclei; only a few were shrunken and pyknotic. The elongated clusters had arisen, apparently, from the long nuclear chains. On disintegration of the fibrils, the nuclei remained.

SUMMARY

To summarize the observations in these four cases, the clinical picture of myotonic dystrophy was present in all. Three gave a history of other cases in the family, although in no case could more than one other member of the family be examined. In case 1, the history was negative, except for a sister with poor vision.

All cases showed the type of cataract described by Vogt as characteristic of myotonic dystrophy, the occurrence of punctate and dustlike

opacities with larger flakes giving a play of colors, sharply localized in a thin zone of cortex just under the anterior and posterior capsules. In two eyes (cases 1 and 4), the cataract had progressed to almost complete maturity. In one case (case 2), the stellate grouping of opacities near the posterior pole, considered by Fleischer as characteristic, was present in both eyes, but the anterior opacities correspond to Vogt's picture, while in four other eyes opacities corresponding completely to his picture were present alone. Hence, from our experience, this is considered as the

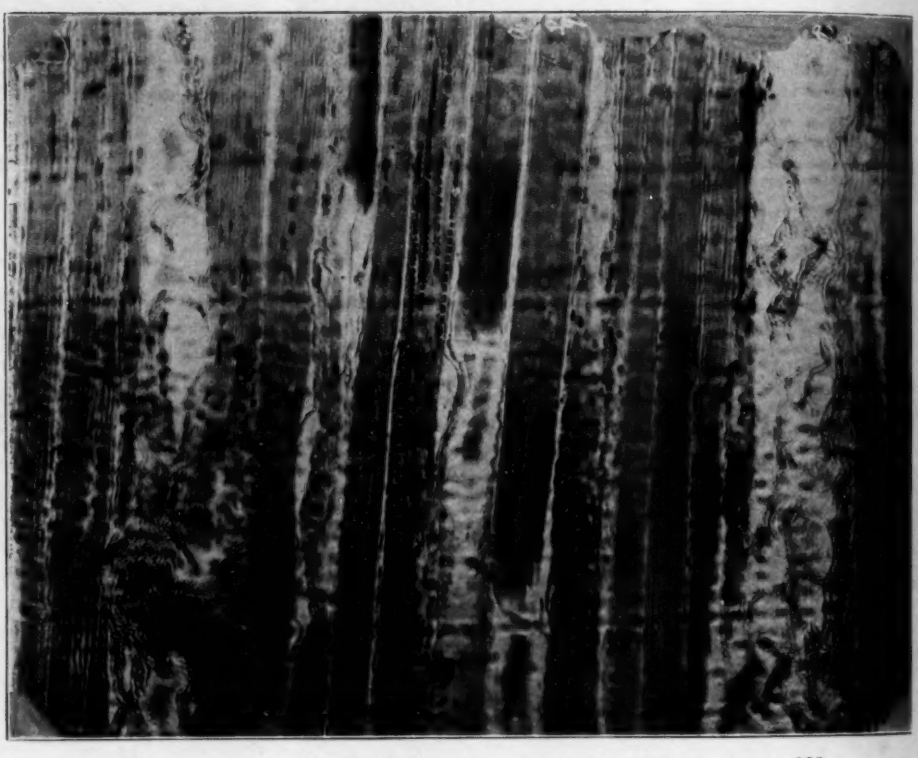

Fig. 6 (case 4).—Longitudinal section of anterior tibial muscle; × 125.

characteristic early feature of these cases, the stellate opacity occurring probably as a later development in some cases only, due to increasing opacification of lens fibers along the suture lines.

The reason for the sharp localization of the early opacities near the capsule is apparently that they affect only the newest layers of the lens, and hence appear only after the disease has reached a certain stage in its progress. Whether all cases of myotonia show changes in the lens must remain an open question until a large series of cases such as Fleischer's has been examined with the slit-lamp, since the earliest changes could easily elude any other examination. The thinness of the affected lens

stratum in case 1, in which the trouble dated back fifteen years, suggests, in view of Vogt's estimated rate of new lens formation, that at the time of onset at least one lens was probably clear.

The various stages by which a mature cataract develops from the early changes seen has never been observed, so far as we know. Apparently after a certain number of the fine opacities have been laid down, the posterior capsule becomes permeable to water, allowing the formation of the stellate posterior opacities and then of water fissures and the usual stages of senile cortical cataract.

Whether or not the slit-lamp picture of the early changes is absolutely characteristic of myotonic dystrophy must also be left until the slit-lamp has been longer in general use, although it is significant that Vogt, in his long experience with it, has never seen a similar picture except in this disease.

Aside from a few cases in which optic atrophy has been seen, no involvement of the eye except cataract seems to occur. The results of numerous extractions in these cases have nearly all been good, so that the cataracts are not to be considered as complicated cataracts.

Knüsel [18] recently described the slit-lamp examination in three cases of postoperative cataract following thyroidectomy which were almost indistinguishable from those of myotonic dystrophy, consisting of dustlike and punctate opacities and crystals in a zone under the anterior and posterior capsule with some of the dustlike opacities extending into the embryonal nucleus. He considered this evidence in support of the theory that myotonic dystrophy is due to a parathyroid deficiency.

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18. Knüsel: Arch. f. Ophth. **113**:636, 1924; for a general discussion of myotonic dystrophy see: Fearnsides: Rev. Neurol. & Psychiat. **13**:311, 1915. Adie and Greenfield: Brain **46**:73, 1923.

OCULAR DISTURBANCES IN EPIDEMIC ENCEPHALITIS *

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Another consideration of the ocular manifestations in epidemic encephalitis is now in order as new cases of this disease have been appearing lately; indubitable material has not been seen for about two years. Intermissions of epidemic stress have occurred twice since the original appearance of this condition in 1917. The late free period was, therefore, comprehensible and did not give any real sense of security to those observers who had been aware of the fluctuations in incidence of this disease both here and elsewhere.

It has been customary to speak of encephalitis as though it were a totally new disease. In a sense this is justified by its absence for two generations; but in 1718, "Schlafkrankheit" was described by Camerarius, who noted the difficulty in raising the eyelids, and by Gayet, in 1875, who wrote of "ophthalmoplegia of acute onset and accompanied by apathy and somnolence"; in these cases double ptosis and bilateral palsy of the third nerve with divergent strabismus were present.

In such a disease as the one under consideration, it is inevitable that the variety of symptoms must be extreme; a widespread neurotropic infection must produce a great many different disease pictures, which will vary with the structure affected. Variety in such pictures is furthered, because from lesions of the nervous system may come either obliterations of normal functions or release of functions normally controlled by centers higher in the neural heirarchy. It is possible also that variety of clinical form in epidemic encephalitis may be produced by variety of virus or by a constant virus varied by appearing in different evolutionary phases.

It is customary to recognize tremors, spasms and so-called athetotic attitudes of the limbs in this condition resulting from disease of the basal ganglions, whereby the normal cortical control is removed from motor centers of lowlier attributes and greater phylogenetic age.

This damage to ganglionic mechanism causes many involuntary, or almost involuntary, movements, which too loosely have been classified among the tics or habit spasms. Such, for example, is spasmodic torticollis and dystonia musculorum, which, before the motor functions of the lenticular nuclei were known, were designated vaguely as "func-

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* Read before the Section on Neurology and Psychiatry, New York Academy of Medicine, Nov. 13, 1928.

tional." Certain blepharospasms occurring in acute encephalitis are of precisely the same nature. From the onset of her illness, one of my patients had bilateral tremor of the masseters associated with rhythmic muscular action which gave rise to a champing movement of the jaws. Two other patients were rarely able to close the mouth for more than a few seconds at a time; the mouth was held so widely open that the uvula and pharynx were always in full view, and articulation was grossly impeded. Of precisely the same nature as these release phenomena is stammering, which, without any psychic trauma, comes on from three months to two and a half years after the first symptoms. The forcible spasmodic shutting of the eyes is also of this nature, and may last so long at a time as to make it necessary for the patient to be led about as though blind. Ptosis of the eyelids is a frequent symptom of encephalitis, and is often found in association with weakness or paralysis of both external recti; perhaps, as Ward Holden has said, this particular combination of conditions of the third and sixth nerves is peculiar to this disease. However, it must be emphasized that the grimacing, violent closure of the eyes, to which I had referred as blepharospasm, has nothing physiologically in common with ptosis. The latter is due to a direct attack on the third nerve or nucleus; the former occurs through the pouring down of an ungoverned stream of tonic impulses from basal ganglions freed from their normal cortical government. This occurrence of striatal tonic impulses stimulating muscle groups abnormally into unusual and involuntary activity must always be kept in mind when the neurophysiology of this disease is investigated. For instance, Holden has described in several encephalitic patients a well marked "paralysis of divergence" in which, with normal eye mobility, the eyes are focused on a point about 15 cm. away and see single at this distance, while at a greater distance there is homonymous diplopia in every direction of the gaze. Holden expressly said that there is no spasm in the recti muscles, but he is unable to give any explanation of the nervous mechanism involved. However, I have observed definite spasm of extrinsic eye muscles in the acute period of this disease, producing appearances of skew deviation such as those which are seen in cerebellar disease of the middle peduncle. Transient diplopia, usually unaccompanied by strabismus, is perhaps the most frequent single diagnostic feature of the early stages of encephalitis, and many patients suffering from paralysis agitans by their histories of passing double vision furnish the clue to the origin of their condition. It seems to me probable, therefore, that this early diplopia may often be the result of paralysis of divergence through spasm of the recti; the frequent appearance of this symptom is difficult to explain on the hypothesis of transient paralysis and can be understood more easily as coming from muscle spasm, especially as muscle spasms of striatal origin are common occurrences elsewhere.

Reference has already been made to the peculiar rhythmic character of some of these muscular spasms; for instance, in the masseters they produce a fishlike movement of the jaws. The same rhythmic movements have been seen in the extrinsic eye muscles; they do not always affect both eyes in conjugate movement. In four patients, these movements have been seen affecting only one eye at a time, the regular jumping of one eyeball in one direction furnishing a highly startling and somewhat uncanny appearance.

All possible types of palsy may occur, complete and incomplete, in single eye muscles or in muscles acting in association with each other. Wide fluctuations in severity from day to day or week to week are inevitable in view of what is known of the pathologic process, which consists of a perivascular lymphocytic infiltration especially affecting the brain stem, the area around the aqueduct, and an interstitial infiltration of cranial nerve fibers by lymphocytes.

There is apt to be a special incidence in the region of the quadrigeminal plate, near or in the oculomotor nuclei. This necessarily produces the syndrome of that area so often described by the name of Parinaud as a diminution or loss of conjugate associated movements of the eyeballs upward or downward. Less commonly, there is interference with lateral conjugate action. It should be noted that while these losses of muscular function occur commonly in the acute stage of the disease, they may be slowly progressive over a period of some years in cases that have become chronic. It will be remembered that in cases of long standing there is a widespread neuroglial proliferation and degeneration of vascular walls with numerous thrombi and small hemorrhages.

The subependymal periaqueductal changes are, of course, the cause of the not rare appearance of an Argyll Robertson pupil in encephalitis. Near the aqueduct, inflammatory processes can easily strike colliculonuclear fibers before they reach the nucleus of the third nerve, and in that position fibers for accommodation are almost remote. The old idea that the Argyll Robertson pupil is synonymous with syphilis of the central nervous system has been discarded for many years. Even tumors affecting the mesencephalon often give rise to this condition. Some years ago I was able to report the case of a neoplasm of the temporal lobe which by expanding toward the midbrain gave rise at times of increased pressure to transient Argyll Robertson pupils and at the same time to transient Parinaud's symptom complex. If lesions as gross as neoplasms can give rise to this localized iridoplegia for brief periods, it is obvious that a protean pathologic process such as the one just described, with peculiar incidence on the mesencephalon, must frequently interfere with pupillary actions and make pupils irregular and unequal temporarily, for long periods or permanently, and not rarely produce true Argyll Robertson phenomena.

In addition to the Argyll Robertson pupil, one may find a paresis of accommodation which as an isolated condition usually occurs only in diphtheria. Ward Holden stated that this paresis of accommodation in encephalitis is usually bilateral, whereas in syphilis it is usually found only in one eye.

Nystagmus is almost the rule in acute encephalitis. It may be of both cerebellar and labyrinthine varieties; that is, it occurs in both lateral and vertical directions. Furthermore, it is often characteristic in its extraordinary "electric-like" rapidity. Dautrevaux [1] stated that nystagmus in this disease is never "static," but is present only on ocular movement. This has not been my experience. The rapid shivering movements of the globe are present at rest and are usually accompanied by sensations of intense dizziness; they probably emerge as a result of the implication of Deiters' nucleus or the central vestibular connections.

Only once have I seen a true retrobulbar neuritis in this disease. In that case the condition was unequivocal, in that a central scotoma was easily demonstrated in the left visual field, and temporal pallor of the disk ensued later. During the height of this episode, a true retrobulbar pupillary reaction was present, i.e., rapid contractions of the pupil to light followed by rapid dilatation despite the maintenance of illumination. In this connection, one remembers that perivascular infiltration of the optic nerve was observed by Mills and Wilson. It is probable that transient retrobulbar neuritis is commoner than has been supposed; the lack of cooperation in most encephalitic patients would tend to cause this condition to be overlooked frequently.

Papilledema in epidemic encephalitis is not common; Holden found one case among 100 patients seen at Mount Sinai Hospital, and one in twenty at the New York Neurological Institute. On the other hand, I was able to associate a number of patients as a clinical encephalitic group in which the late occurrence of papilledema was a constant feature of the disease.[2]

None of these patients had the general coloring which is now associated with epidemic encephalitis, but the fact that they were seen during the period of incidence of that disease and not before, makes one cautious about asserting that the two diseases are unrelated. My patients all had evidence of systemic infection as shown by the presence of a changed blood picture, fever and general malaise. The onset was acute—in some cases, sudden—with headache serving as an inadequate warning. In all, a period of stupor was followed by one of excitement or disorientation, which lasted only a few days in most

1. Dautrevaux: Thèse de Paris, 1920.

2. Kennedy, F.: Acute Benign Meningo-Encephalitis with Papilledema, Arch. Neurol. & Psychiat. **7**:53 (Jan.) 1922.

instances, to be followed, as a separate episode, by focal cerebral palsy-hemiplegia, hemianopsia, aphasia or inadequacy of the cranial nerves. The rushing onset of optic neuritis late in the illness, synchronizing with amelioration of symptoms previously acquired, and its rapid amelioration in turn, are phenomena with which I had been unacquainted, and which for their production depended on sudden blockings of interventricular drainage by meningitic exudate and for their disappearance, on a reconstitution of a normal fluid mechanism.

CIRCUMCORNEAL TRANSPLANTATION OF BUCCAL MUCOUS MEMBRANE AS A CURATIVE MEASURE IN DISEASES OF THE EYE*

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In a paper read before the Section on Ophthalmology of the New York Academy of Medicine, on Feb. 20, 1911, I [1] recommended circumcorneal transplantation of mucous membrane from the mouth as a curative measure in diseases of the eye. Since then, I have performed this operation in a large number of cases, not only for trachomatous pannus, but also for scrofulous pannus, for torpid and dystrophic processes of the cornea, the character of which is often obscure, and also for herpes. An excellent field for grafting is presented by burns of the conjunctiva and cornea.

In analyzing the curative effect of a graft on a diseased cornea, it seems to me that the important point is the improved nutrition of the cornea, diseased mucous membrane of the eye being removed and replaced by healthy mucous membrane from the mouth. However, not only will the nutrition of the cornea be put on a healthier basis, but the amount of fluid that filtrates into the cornea will be increased because of the hyperemic influence of the transplanted flap. In cases of pannus, the flap will also act like a cushion and form a barrier against the heavy rubbing of the upper lid.

In my first paper,[1] published in 1911, and also in all subsequent papers, I laid down the rule that no transplantation should be made for pannus unless complications like folliculosis, especially in its acute stage, diseased tarsus and trichiasis have been done away with. For these conditions, I usually practice expression with the roller forceps, excision of the tarsus (Kuhnt), electrolysis or some plastic operation. Of late, autohemotherapy and roentgen and ultraviolet irradiation have been recommended. I laid down the foregoing rule because I had found that in acute forms of folliculosis the graft was invaded by trachomatous follicles; this observation has recently been confirmed histologically by Seefelder [2] of Austria. Pannus that is associated with acute folliculosis and a diseased tarsus as a rule is cured when the trachomatous process is healed, regardless of the treatment used. It is

* Submitted for publication, Feb. 13, 1929.
* Read before the Section on Ophthalmology, New York Academy of Medicine, Jan. 21, 1929.
* From the Eye Department of the Lenox Hill Hospital.

1. Denig, Rudolf: Reports of the Section on Ophthalmology of the New York Academy of Medicine, Feb. 20, 1911, Ztschr. f. Augenh. **25**:277, 1911.
2. Seefelder: Klin. Monatsbl. f. Augenh. **81**:58, 1928.

for pannus occurring in the cicatricial stage of trachoma that transplantation should be done. This kind of pannus is dangerous, and often ophthalmologists are helpless in coping with it. This has been confirmed by others, for instance, Kerschmann [3] of Russia who in 1926 published a report of nearly 200 cases of pannus in which transplantation was done. He said:

> Every one who has anything to do with trachoma knows that pannus yields comparatively easily to ordinary treatment provided it be associated with an active trachomatous process in the tarsus and the fornix. The worst and most dangerous cases of pannus are those in which the cicatricial stage of trachoma has established itself. In such cases the pannus will return with nearly mathematical precision after periods of improvement; they end frequently in total xerosis of the cornea and the conjunctiva. It is in just such cases that Denig's operation yields splendid results and is practically the only thing that saves such eyes from blindness.

Kerschmann added:

> In all serious cases of pannus, however, that do not yield quickly to ordinary treatment, we also perform Denig's operation, on general principles.

If one draws conclusions from the foregoing statements, it seems as if a cicatrized trachomatous conjunctiva no longer possesses enough vitality to fight the trachomatous process on the cornea, while a graft, producing hyperemia with increase of nutritive material through the capillaries of the limbus, is able to do so.

Another point to be noted in treatment is a certain amount of isolation which is effected by the interposition of a graft between the area affected by trachoma in the cornea and its base, the trachomatous conjunctiva. If by chance the graft, having been cut too thin, is absorbed and the barrier thus broken down, the trachomatous process as a rule may be seen reestablishing itself on the cornea. In some cases, even after a successful transplantation, harmless tiny blood vessels on the cornea are seen to persist, having formed anastomoses with those of the sclerotica. In the overwhelming majority of cases the infection of the cornea clears up after transplantation and remains quiet; once in a great while, it may show occasional irritation which rarely leads to a recurrence of the pannus and the necessity of another grafting.

Of the many papers on transplantation for trachomatous pannus published during the last few years, besides that of Kerschmann, I wish to mention those of Arkin, Pilmann, Uljanizkij, Budel and Filatow,[4] Malkin,[5] all Russians, von Blaskovics [6] of Hungary and Mallol

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3. Kerschmann: Klin. Monatsbl. f. Augenh. **77**:400, 1925.
4. Arkin, Pilmann, Uljanizkij, Budel and Filatow: Russian papers reviewed in the German literature in 1927 and 1928.
5. Malkin, B. M.: Klin. Monatsbl. f. Augenh. **80**:561, 1928.
6. Von Blaskovics, L.: Klin. Monatsbl. f. Augenh. **80**:406, 1928.

de la Riva [7] of Spain. Malkin summed up his experiences as follows: "In all cases of trachomatous pannus which require surgical intervention, Denig's operation should be given preference."

Relying on the hyperemic effect of a graft, I [8] recommended, in 1912, transplantation for scrofulous pannus, torpid and dystrophic processes of the cornea, and also for herpes. I have seen some excellent results from this operation in cases in which nothing else would help. As far as true pemphigus is concerned, it seems doubtful whether transplantation will be able to arrest the disease; so far, I have not had a chance to perform transplantation in such a case. It should be done in the first stage and not when the shrinking has set in. Hoeg [9] reported three cases of pemphigus for which he tried transplantation of mucous membrane and of skin without success. His paper was not accessible, and I read only a short report of it in the German literature.

A new field for grafting has also been opened in the treatment for acne rosacea keratitis, which is sometimes an exasperating and even hopeless disease in regard to treatment. In 1927, I[9a] mentioned in one of my papers one such case in which cure was effected by grafting. Since then, Piries [10] has published reports of ten successful cases.

I also saw good results in cases of sclerokeratitis of tuberculous origin, in which tonguelike infiltrations starting from the limbus invaded the cornea, but not in cases of solitary keratitis in which the corneal opacities have no connection with the limbus. In one case of sclerokeratitis I had to employ two grafts, as after the quick disappearance of one infiltration two more started nearly opposite the first about two weeks later.

Since 1912, I have recommended immediate transplantation also for burns of the eye. My own experience mainly covers lime burns, a few ammonia burns and a burn caused by the contents of a golfball. The operation should be done immediately or at least as soon as possible, as delay means inviting disaster. This is especially true for ammonia burns. As I said in a paper in 1904 and again in 1914,[11] ammonia burns are tricky. This has lately been confirmed experimentally by Hertel and Loehlein.[12] Though the eye shows hardly any reaction for a week or ten days after even a comparatively slight ammonia burn, violent inflammation with necrosis of the cornea and total loss of the eye may occur. Only immediate grafting may save such eyes from

7. Mallol de la Riva: An. de la acad. med. quirurg. espanola **14**:582, 1928.
8. Denig, Rudolf: München. med. Wchnschr. **59**:579, 1912.
9. Hoeg: Hospitalstid., 1928, vol. 71, nos. 10 and 11.
9a. Denig, Rudolf: Arch. f. Ophth. **118**:729, 1927.
10. Piries: Arch. d'ophth. **45**:308 (May) 1928.
11. Denig, Rudolf: Ztschr. f. Augenh. **31**:485, 1914.
12. Hertel, Loehlein and Fischer: Klin. Monatsbl. f. Augenh. **79**:853, 1928.

destruction. While confirming my statements about early transplantation for burns in general, Thiess [13] of Germany did not agree with me in regard to ammonia burns, although he had not had any experience with transplantation in such cases. Because of the experiments of Hertel and Loehlein on animals, which demonstrated the presence of ammonia in the aqueous humor of the anterior chamber within ten minutes, he thought that nothing could be done in cases of ammonia burns. My advice, however, is to operate as soon as possible in such cases, for experiments on animals and daily ophthalmologic practice are two different things; for instance, not all ammonia burns are caused by concentrated ammonia, and even in those in which a concentrated solution has burned the eye, the first thing a patient instinctively does is to wash his eye with plenty of water. One of my patients stated that he had burned his eye with ammonia; as I found out afterward, it was a mixture of ammonia and benzine. The conjunctiva in this case was burned and partially necrotic, and the cornea showed diffuse cloudy opacities. Circular transplantation was made five days after the accident, and the eye recovered. One should give every eye a chance of recovery, even an eye which is known to have been burned by concentrated undiluted ammonia; if it should be lost in spite of grafting, one at least has the satisfaction of knowing that everything possible has been done.

The question whether transplantation should be made in extensive burns of the conjunctiva and cornea must be answered in the affirmative. What else but immediate transplantation could have saved from utter destruction the eye that I [14] described in the *American Journal of Ophthalmology* in 1920? In this case, the entire bulbar conjunctiva was destroyed and that of the culdesac was extensively burned (lime burn); two large circular grafts transplanted five hours after the accident saved the eye, which retained 20/70 of normal vision (irregular astigmatism).

Generally speaking, I practice immediate transplantation for burns in all cases in which the cornea shows a defect; I also practice it in cases in which the cornea is intact but the conjunctiva is considerably burned. This applies without exception to all ammonia burns; concerning other burns, I admit that slight defects of the cornea, for instance, those caused by lime burns, may yield to ordinary treatment, but I have learned that transplantation in such cases not only removes the feeling of uncertainty in regard to the ultimate result, but accomplishes the cure within a much shorter time. If the flap itself should disfigure the patient cosmetically, it can always be removed about a year later without

13. Thiess: Arch. f. Ophth. **120**:689, 1928.

14. Denig, Rudolf: Am. J. Ophth. **3**:256, 1920.

much trouble, a piece of conjunctiva from the other eye furnishing, if necessary, the material to cover the defect.

I performed transplantation also in a few cases of old burns complicated by traumatic pterygia and numerous blood vessels, running from the limbus over to the opaque cornea. Not too much can be expected in such cases, as the cicatricial cornea has become too sclerotic to clear up very much; nevertheless, such an attempt should be made whenever the patient has only one eye left. In one of my cases, in which a lime burn had been present for nearly a year, vision increased from light perception to counting fingers at 10 feet. In another case in which a phenol burn had been present for twenty-six years, a chronic traumatic pannus covering the nasal half of the cornea had of late made some progress and covered nearly the entire pupil, vision being reduced to counting fingers at 1 foot. Six weeks after transplantation, vision had improved so that the patient could count fingers at 12 feet. In a third case, in which the burn had been present for twenty years, the patient could perceive light only for many years; a number of blood vessels ran from the limbus over to the sclerotic, white and opaque cornea. When operation was performed, large traumatic pterygia had to be removed. In this case the old sclerotic infiltrations of the cornea refused to clear up, and the sight was not improved.

Schieck [15] of the university eye clinic of Wurzburg, Germany, was the first to follow my initiative and to perform early grafting successfully in a case of lime burn. Thiess also published reports of a number of cases. I have received various letters from colleagues confirming my claims about immediate transplantation for burns. Among these letters was one which recently came from von Blaskovics in Hungary, who made such a transplant, also for a lime burn.

TECHNIC

I described the technic of the operation in a paper [16] published in 1918. However, I shall emphasize a few points:

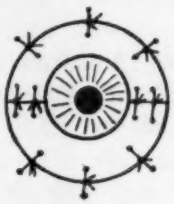
After excision of the conjunctiva with subconjunctival tissue along the edge of the morbid process—if necessary, all along the limbus—great care should be taken to lay the sclerotica entirely bare. This can be done with a scalpel or a scarifier. It does not make much difference whether the mucous membrane is taken from the lower lip or the inside of the mouth. The width of the excision in the conjunctiva should be from 6 to 8 mm. After the graft is secured, it should be placed on the back of the middle finger and trimmed with a fine pair of straight scissors while the assistant is sewing up the wound in the mouth with catgut. Fat and blood vessels but not connective tissue should be removed if the grafting is to be done for the relief of pannus, and one should rinse the graft from time to

15. Schieck: Klin. Monatsbl. f. Augenh. **79**:817, 1928

16. Denig, Rudolf: New York M. J. **107**:1074, 1918.

time with warm saline solution. It is then removed from the finger directly to the eye by means of a spatula. If transplantation is made in cases in which the tarsus has already been removed, there may not be enough conjunctiva left for excision, as the culdesac has been shortened by the operation. In such cases the conjunctiva is not excised but simply undermined, and the flap is slid under it and secured by a few sutures.[16a]

When a circular transplantation is made, two grafts should be used for the purpose of avoiding contraction of, and encroachment on, the cornea. There is no reason why these two grafts should not be transplanted at the same time, as I always do. If transplantation has to be performed on both eyes, both operations should be done at the same time, as the postoperative binocular bandage will cause an unnecessary irritation of the eye in which transplantation has already been done. In a number of cases I have removed the graft again for cosmetic reasons after the eye could be said to be cured, i. e., I removed that part of the graft which was exposed to the inquisitive eye of the public.



Two grafts used in circular transplantation.

The same, and I think the only, objection to this operation as creating a cosmetic disturbance can be made to transplantation for pterygium, which I [17] advocated as far back as 1913 and which has since been done by Wessely in Germany, Duverger in France and others. I have found, however, that in time all the grafts become a little paler.

A graft may become nearly entirely absorbed if too much of the connective tissue and the mucosa has been cut away; on the other hand, some of the grafts that I transplanted sixteen and eighteen years ago have kept their original thickness. The graft should lie smoothly on the defect and should be slightly stretched [16a] while being sutured. It should cover but not overlap the limbus. For this reason after the flap has been sutured, the patient is directed to look up and inward—the position taken by the eye when it is covered by a bandage; the edge of the flap is then trimmed so as not to overlap but just to cover the limbus.

16a. This disposes of Loewenstein's modification of Denig's operation, published in Ztschr. f. Augenh. **67**:68 (Jan.) 1929, while this article was in press.

17. Denig, Rudolf: Klin. Monatsbl. f. Augenh. **51**:589, 1913; Ztschr. f. Augenh. **31**:486, 1913.

A bandage is placed over both eyes for fully five days. The dressing is removed every day and the secretion wiped off, but the patient is by no means allowed to open either eye. The patient is discharged seven days after the operation; the sutures are removed on the tenth or twelfth day.

In the beginning in several cases I also grafted skin taken from the ear, instead of mucous membrane from the mouth. Skin perhaps possesses an even greater hyperemic quality than the mucous membrane, but I found in older people that the epidermis had a tendency to desquamate. In some such cases, I have taken the skin off again and have replaced it by mucous membrane.

But for the World War and its after-effects, circumcorneal transplantation would long ago have been understood by every ophthalmologic surgeon. In 1913, Kerschmann was ready to publish a report of the cases in the Pines clinic, when the vicissitudes of war destroyed all his records. During the last three years, a considerable literature on the subject has developed and is steadily increasing.

CULTIVATION OF LENS EPITHELIUM IN VITRO

A FURTHER STUDY *

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In a former report [1] by one of us (Kirby), the object of our original investigation was stated to be a study of the nature of the cause of senile cataract and the possibility of its prevention or arrest by nonsurgical means. Various considerations showed that it was unwise to conduct such a research from the clinical side alone, as the same difficulties which have confronted other observers still remain unsolved from a scientific standpoint.

It was thought that much might be gained from a combination of clinical and fundamental laboratory studies. Attempts were to be made to study the living lens cells and to cultivate them outside the body. It was thought that living lens cells would form a suitable basis for research into the nature of the growth, nutrition and death of lens cells, after the differences which would exist in vivo and in vitro were discounted. The differential environment and the anatomic relations in vivo could not be reproduced in vitro, but valid conditions for experiment might be created for lens cells as Carrel [2] had produced them for fibroblasts. Of necessity, we were forced to use the cells of lenses other than those of human beings for our research.

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* Submitted for publication, Dec. 26, 1928.

* Read at a meeting of the American Academy of Ophthalmology and Oto-Laryngology, St. Louis, Oct. 17, 1928.

* The details of the experiments are given in the original and complete article published in the Transactions of the American Academy of Ophthalmology and Oto-Laryngology, 1928.

The work was aided by a grant from the American Academy of Ophthalmology and Oto-Laryngology to Dr. Daniel B. Kirby, Research Fellow for the Academy. It was also aided by a research fund secured by Dr. John M. Wheeler from an anonymous donor. The work was conducted by the Department of Ophthalmology, in the Departments of Anatomy, Physiology and Chemistry at the Medical College of New York University, and in the Department of Chemistry at Washington Square, New York University.

1. Kirby, Daniel B.: The Cultivation of Lens Epithelium "in vitro", Arch. Ophth. **56**:450, 1927; A Study of the Nutrition of the Crystalline Lens, Tr. Am. Acad Ophth. and Oto-Laryng., 1926, p. 137.

2. Carrel, A.: Pure Culture of Cells, J. Exper. Med. **16**:165, 1912; Measurement of the Inherent Growth Energy of Tissues, ibid. **38**: 521, 1923; A Method for the Physiologic Study of Tissues in Vitro, ibid. **38**:407, 1923.

In one experiment [1] it was shown that the chick embryonic lens would live and differentiate in vitro in suitable mediums. Another experiment [1] showed that if the entire lens is dissected free from extraneous cells and cultivated in its capsule, cells from within will not grow outside the uninjured capsule. From a small number of these lenses cultivated in toto, it was possible to get growths of living cells from the inside of the lens. These were proved to be from the anterior and equatorial epithelium. The cortex cells, representing devitalized cells, did not reproduce. Many cultivations of the lens in toto proved the efficiency of our method of dissection. Recognizing a lens in toto to be microscopically free from extraneous tissue after dissection, we could immediately and with assurance make explants from its epithelium and later prove the cultures to be microscopically free from other cells. By a series of divisions of the original culture, a number of subcultures were obtained, so that a single strain was carried on through seventeen generations over a period of six weeks.[1]

We have concerned ourselves this season with a further study of the behavior of lens cells when grown in vitro. We will report further observations of their characteristics and also some control experiments which were conducted with them.

PERCENTAGE OF SUCCESSFUL ORIGINAL EXPLANATIONS OF LIVING LENS EPITHELIUM

Not all original explants of lens epithelium prepared from fresh lenses of chick embryo lived and multiplied in vitro. Depending on the condition of the cells and the suitability of the mediums, some cultures flourished, while others just survived. A number of explants of epithelium showed a tendency to infold and join their edges and form miniature transparent crystalline lenses. These were subdivided, and active growths were often obtained in subcultures. Some original explants showed evidence of not having survived at all, while others died after a short period of survival.

During a period of eight months, 294 original explants of lens epithelium were made. Of these, 174, or 59 per cent, showed active growth after forty-eight hours. Of the 174 successful primary cultures, 112, or 38 per cent, of the 294 original explants, survived the second transfer. Of these, 56 or 19 per cent of the original explants survived the third transfer.

THE SUCCESSFUL CULTIVATION IN UNBROKEN STRAIN OF LENS EPITHELIUM OVER A PERIOD OF SEVEN MONTHS

In a previous paper,[1] it was reported that it was possible to carry on a strain of lens epithelium over a period of six weeks through

seventeen generations. The cultures were thriving when the work was discontinued.

During the present period of research, a number of strains developed from original explants have thrived through a varying number of generations. One strain, culture no. 87-1, was started as an original explant on Nov. 28, 1927. It was carried through 112 passages into new mediums over a period of seven months.

This strain demonstrated that lens epithelium in vitro can live for an indefinite period. It was grown in equal parts of adult chicken plasma and chick embryo (minus the eyes) juice. The medium was changed every forty-eight hours, except over the week-ends when it was changed after a shorter period or put on the shelf at room temperature for a period of from eighteen to twenty-four hours.

CULTURES OF LENS EPITHELIUM FOR CONTROL EXPERIMENTS AND RATE OF GROWTH IN VITRO

For experiments with tissues in vitro, it is necessary to control the culture growth in experimental mediums with a similar or related culture grown in control mediums. Matched or related pieces of tissue were used. These were obtained from cultures of the same or of a related strain.

For the purpose of comparison of the growth of lens epithelium cultivated in experimental mediums, it is desirable to have data on the rate of growth of the matched or related pieces of tissue when placed in normal or control mediums.

To estimate the rate of growth, the square area of the explant is compared with the square area of the growth after forty-eight hours. The method described by Ebeling [3] was used. Briefly, it is as follows:

Before incubation the explant is placed in the projectoscope, magnified by 50 and its outline traced on paper. This procedure is repeated forty-eight hours later to trace the outline of the growth. The surface area is measured with the aid of the compensating polar planimeter. Of ninety-six explants made, sixty-three (65 per cent of the total) had an average surface area of 0.25 sq. mm. They measured approximately 0.5 by 0.5 mm. Of the ninety-six cultures, sixty-seven (68 per cent of the total) had an average surface area of 1.75 sq. mm. The cultures appeared to be larger than this figure would represent. The delicate finger-like peninsulas extending out from the body of the culture left spaces between them that were not covered by the lens epithelial cells.

The relative increase of lens epithelium in vitro was obtained by dividing the surface area of the growth (the total surface area after forty-eight hours minus the surface area of the original explant) by the surface area of the original fragment. The average relative increase in ninety-six cultures was seven times the size of the original transplant.

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3. Ebeling, A. H.: Measurement of the Growth of Tissues in Vitro, J. Exper. Med. **34**:231, 1921.

SENSITIVITY OF LENS EPITHELIAL CELLS TO CHANGES IN THE CONSTITUENT INORGANIC SALTS IN NORMAL MEDIUMS

It was important to determine whether lens epithelium in vitro was sensitive to minor changes in the constitution of the mediums. Experiments were devised in which various inorganic salts normally present [4] were increased 25 per cent over the normal.

In each series of experiments except one, the control cultures were more successful, on the average, than the experimental cultures growing in the altered mediums. In one series, in which the medium showed a 25 per cent increase in the monosodium acid phosphate content, the experimental cultures were better than the control. The results of these experiments would indicate that lens epithelium in vitro reacts in sensitive fashion to changes in the medium.

THE EFFECT OF HYPERTONIC AND HYPOTONIC MEDIUMS ON LENS EPITHELIUM CULTIVATED IN VITRO

A large series of experiments were conducted to determine the effect of variations of the osmotic tension of the medium on the growth of lens epithelium. This was thought to be important, for while the lens epithelium had previously been observed to grow best in a normal medium, it had also been noted that a normal medium was not isotonic for the lens cortex. A solution containing 1.2 per cent sodium chloride had been found isotonic for the cortex. It was thought that lens epithelium grown in mediums having an osmotic pressure higher than normal might show different characteristics.

EXPERIMENTS

The first experiments were designed to find the toxic points for hypertonic and hypotonic mediums.[5] It was proposed to add sodium chloride in measured quantities to the medium until it became too concentrated for growth, and then in another series of experiments to add water until the medium was too dilute for growth. Triple distilled water and conductivity water were used in the tests. To keep the same relative amounts of normal plasma and fresh embryo extract in the control and in the experimental mediums, Tyrode solution [4] was added to the control medium in the same quantity as the salt solution in the experimental medium.

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4. Fischer, A.: Tissue Culture Textbook, Copenhagen, Levin and Munksgaard, 1925, p. 85.

5. Ebeling, A. H.: The Effect of the Variation in the Osmotic Tension and of the Dilution of Culture Media on the Cell Proliferation of Connective Tissue, J. Exper. Med. **20**:130, 1914.

Ebeling [5] found that variations in the osmotic tension of the medium from the normal at first tended to stimulate growth of the fibroblasts and then after a few days always to retard it. It was not feasible for us to carry the experimental cultures through a number of generations. We based our results on a comparison of the forty-eight hour growth of the control and the experimental cultures, and the uniformity of the results showed that the method was correct. If the cultures had been kept in the experimental medium longer, they might have shown a more gradual curve toward the toxic point.

It was found that hypertonic mediums containing 1 per cent, 1.2 per cent, 1.4 per cent and 1.6 per cent sodium chloride had an irregular effect on the cultures of lens epithelium. In each case, one of three cultures was stimulated to greater growth than the control, while two were depressed in their growth. In the mediums containing 1.7 per cent, 1.8 per cent and 1.9 per cent sodium chloride, the effect was of fairly marked depression of the growth, and signs of toxic effects appeared in the cultures. In some preliminary experiments, the mediums containing 1.75 per cent and 1.9 per cent proved lethal to one of the three cultures; 2 per cent and any higher percentage of sodium chloride proved lethal to all the experimental cultures.

THE ACTION OF HYPOTONIC MEDIUMS ON LENS EPITHELIUM IN VITRO

To produce hypotonic mediums, triple distilled water was added to the medium in gradually increasing percentage. Even in the experiments in which 35 per cent and 50 per cent of water was introduced, there was sufficient embryo extract present to nourish the cells and stimulate them to growth and sufficient plasma present to form a good homogeneous clot. The factor, then, that produced the toxic effect was the hypotonicity or the lowering of the osmotic tension of the medium.

From the results, it was found that 5 per cent dilution with water has hardly any stimulating or ill effect on the cells; 10 and 15 per cent dilution had quite a marked depressant action on the growth; 25 per cent had a greater effect than is evident from the ratio of the experimental to the control cultures, as there were many dead cells in the cultures. These cultures could not be restored by a return to normal mediums. Dilutions of 35 per cent and 50 per cent proved lethal to all experimental cultures.

ACTION OF A MEDIUM WITH A HYDROGEN ION CONCENTRATION OF 8.2

It had been noted frequently that for some unknown reason, Tyrode solution tended to deteriorate and that its hydrogen ion concentration tended to change from a desirable p_H of 7.8 or 7.9 to 8.2 or 8.4. Cul-

tures placed in mediums made up with the latter did not thrive. Experiments were conducted to compare the effect of this slightly more alkaline mediums with the normal.

The effect of the slightly more alkaline medium was to cause a fairly marked depression of the rate of growth in the first cultures. In the second cultures, there were many dead and dying cells. The cultures were in a poor condition and did not survive. All the cells were found dead in the third cultures.

The toxic agent in this medium was evidently the altered hydrogen ion concentration, the medium being slightly more alkaline than normal, or it was the factor that brought about the change in the p_H.

TOXIC INFLUENCES ON LENS EPITHELIUM

When toxic influences beset our cultures, affecting not only the lens epithelium but also the iris epithelium and the fibroblasts, it was often difficult to discover the exact factor at fault. The glassware was sometimes to blame; at other times it was the water used in making up the solutions, and again the plasma or the embryo juice.

The toxic factor could often be discovered in a particular combination of mediums after a number of cultures had been debilitated or killed. At times, the effect was lethal, the cultures dying quickly and not at any time showing an effort at migration or cell division. The central fragment became opaque. At other times, transparent cells and peninsulas of cells grew out from the central fragment more slowly and to a lesser extent than in the normal healthy culture. This was apparently only a retarded rate of growth.

Other cultures showed that the individual cells were sick. The central fragment was more or less opaque, while the outgrowing cells were filled with refractile vacuoles and globules. The cells in the peninsulas retained their contact.

Other cultures showed a retarded toxic effect. Growing out in transparent peninsulas and membrane formation at first, the cells later separated one from the other and remained as isolated, rounded or spherical cells, unable to extend their protoplasmic processes.

Thus, lens epithelial cells under toxic influences in vitro may die en masse or as individual cells. Cells which have not lost their transparency may be revived. Probably some of the highly vacuolated cells may survive. Rounded, isolated lens epithelial cells are most probably dead. Further observations may lead to knowledge of the degree of debilitation of the cells from their microscopic appearance.

THE EFFECT OF TOXIC PLASMA ON LENS EPITHELIUM

In a certain number of instances, it was possible to prove that the plasma contained the toxic factor.

Plymouth Rock chickens, from 1 to 1½ years old, provided the best plasma when bled according to the Carrel technic. Certain debilitated fowls gave plasma which proved toxic. Very young fowls, or those which took the ether badly, also gave toxic plasma. If the plasma gave off the odor of ether, it usually proved toxic. A certain chicken which had been inoculated with Rous chicken sarcoma virus quickly grew ill, and its plasma proved to be toxic.

LENS PROTEIN EXPERIMENT

A Plymouth Rock hen was given intraperitoneal and intravenous injections of a centrifugated solution (saline 4 to 1) of sheep lens protein. The dosage was increased daily, with the exception of two forty-eight hour intervals, from 2 to 18 cc.

This experiment was conducted to provide a serum which would give a marked tissue specific precipitin reaction and high titer in complement fixation reaction. It was thought that such a serum would contain bodies which would react with substances in the cells of lens epithelium grown in vitro and kill them specifically, having no such ill effect on fibroblasts or iris epithelium. It was also thought that this reaction would demonstrate whether or not tissue specific lens protein was produced by lens epithelium grown in vitro.

The medium made up with the plasma from this chicken, no. 002, proved lethal not only to lens epithelium, but to fibroblasts and iris epithelium. No specific effect on the lens epithelium was found. Some tremendous toxic factor had been produced. This experiment should be repeated several times, the conditions being varied to make sure of the result.

THE RESUSCITATION OF CERTAIN SICK AND DEBILITATED CULTURES OF LENS EPITHELIUM

Many experiments that showed the toxic effects of various agents in the medium were conducted against our desires in the matter. The central area would appear more or less opaque. The individual cells would become vacuolated, and those in the periphery would lose contact with the neighboring cells. By immediate transfer to a normal medium and by nursing them through a number of passages, the cultures were often saved. The dead cells would disappear, and the cells in the peninsulas would again appear in apposition to each other. The vacuoles would no longer be seen, and the culture would regain its healthy, transparent appearance.

SUMMARY AND CONCLUSIONS

1. In a further study of the characteristics of lens epithelium cultivated in vitro, it has been possible to verify the experiments and observations previously reported.

2. Of 294 original explants of lens epithelium, 59 per cent survived the first transfer, 38 per cent the second and 19 per cent the third transfer.

3. It was possible to carry a single strain of lens epithelium through unbroken generations by 112 passages over a period of seven months.

4. The average explant measured 0.25 sq.mm. and the average growth 1.75 sq.mm. in surface area. This gave a relative increase of seven times the size of the average transplant.

5. Lens epithelium in vitro is sensitive to changes in the inorganic salts in the medium. It is best cultivated in mediums containing the normal percentage of inorganic salts.

6. A medium with a hydrogen ion concentration of 8.2 was markedly toxic to cultures of lens epithelium.

7. In a certain number of instances, the adult chicken plasma was found to contain a factor which was toxic not only to lens epithelium but to other cells.

8. It is possible to revive certain sick and debilitated cultures of lens epithelium by placing them in normal mediums for several passages.

Obituary

J. M. BANISTER, M.D.

1854-1929

J. M. Banister, Colonel, Medical Department, U. S. Army (retired), died Thursday, Jan. 31, 1929, at the age of 74. A long standing case of cystitis became acute and terminated in hypostatic pneumonia.

Dr. Banister was born in 1854 at Greensboro, Ala., the son of an Episcopal minister. In 1874, he graduated from Washington and Lee University; he then attended the University of Virginia Medical College and received his degree in 1878. He entered the Medical Corps of the U. S. Army in 1879, and served with distinction until his retirement, after over thirty years' service, in 1910.

During his service, he developed his knowledge of ophthalmology by studying in New York and Philadelphia. While stationed at Fort Leavenworth, he carried out a series of tests on healthy soldiers which established a new standard in regard to the dynamics of coordinated movements of the eye. He early recognized the value of the Bassini operation, and through his efforts it was introduced into the army and became the authorized procedure for hernia. When in command of the hospital at West Point, he modernized and equipped the operating room and used his operative skill to give the cadets the benefit of skilled, modern surgery. In the Philippines, while chief surgeon of the Department of Luzon, and later in command of the First Reserve Hospital, he met the problems of tropical medicine fearlessly and successfully. Wherever he served, in whatever situation, he fulfilled his duties with intelligence, courtesy, skill and courage.

The thousands of his friends among the enlisted men and officers bear witness that he ever upheld the highest traditions of medicine and of the U. S. Army.

Dr. Banister was president of the Nebraska State Medical Society in 1919.

My own intimate association with him for nineteen years enables me to testify to those qualities which have endeared him to all his friends. His upright, dignified bearing was symbolical of the spirit whose integrity, honor and uprightness impressed themselves immediately on his fellows. He was often spoken of by his friends as a gentleman of the old school. James Blair, the founder of William and Mary College, and John Blair, Jr., one of the signers of the Declaration of Independence, were members of his family, and his ancestors were among the early English settlers of Virginia and represented the best traditions of the South.

His love for his fellows, moreover, gave that added charm to his innate courtesy for which he was so well known.

Our heads are bowed in sorrow because he has left us, but who can deny that his remarkable embodiment of what was upright, kind and true will increasingly inspire our profession, even though he is gone?

The sun has gone
And yet, now comes the beauteous portion of the day
Lingering but a brief half hour, and then the night.
My friend has gone
And by the glorious coloring of his life and way
Inspiring us forever with increasing light.

H. B. LEMERE.

Notes and News

THIRTEENTH INTERNATIONAL OPHTHALMOLOGICAL CONGRESS

September 5-13, 1929

Under the Patronage of H. M. The Queen Dowager

Honorary Committee

HONORARY PRESIDENTS

H. Exc. the Prime Minister.

H. Exc. the Minister of Education, Art and Science.

H. Exc. the Minister for Foreign Affairs.

H. Exc. the Minister of the Colonies.

H. Exc. the Minister of Labour, Trade and Industries.

H. Exc. the Minister of Public Works.

H. Exc. the Governor-General of the Dutch East Indies.

The High Commissioners of H. M. the Queen in North and South Holland.

The Burgomasters of Amsterdam, Rotterdam, the Hague, Haarlem, Leiden and Delft.

HONORARY MEMBERS

A number of prominent Dutchmen are prepared to take seats on the Honorary Committee.

The undersigned beg to invite you to attend the 13th International Ophthalmological Congress, which will take place in Amsterdam and The Hague from Sept. 5 to 13, 1929. They desire to call your attention to the following points.

1. Membership.

Every one (subject to article VI of the Rules for the International Congress of Ophthalmology) can become a member of the Congress by remitting the equivalent of 25 Dutch Florins to the Treasurer of the Congress, Dr. H. M. Roelofsz, Director of the Incassobank, Heerengracht 531 Amsterdam (Post Office Account 8074).

Members have the right to attend all meetings and all receptions offered to the Congress. Before the commencement of the meetings short abstracts of the symposia and the papers will be sent to them. Those who have not received these abstracts will receive them on their arrival at Amsterdam.

Members will then also receive the reports of the Committees which have dealt with various subjects.

These subjects are: (1) international standardization of the examination of visual acuity, perimetry notation of cylinder axes, light sense; (2) international standardization of the rules for the visual examination of sailors, railwaymen, motor-drivers and airmen; (3) international regulation of the ophthalmologic education of future oculists and general physicians. After the termination of the Congress members will receive the extended reports of the proceedings of the various meetings post-free.

Relations and friends of members of the Congress can be registered as associate members on payment of the equivalent of D.Fls. 12.50. They may attend all receptions and excursions offered to the Congress, but will not be admitted to the ordinary meetings; nor will they receive a report of the proceedings of the meetings.

2. PAPERS.

Members wishing to present a paper must give notice of their intention to the Secretary's Department of the Editorial Committee (Wilhelmina Gasthuis, Amsterdam) not later than June 1, and send a short abstract of their communication. To this should be added a statement of the number and the size of the lantern plates to be shown, while it should also be stated whether an epidiascope or microscopes (and is so, how many) are required for the lecture. Ten minutes are allowed for the presentation of each paper (article 4 by-laws).

3. PROGRAM OF THE CONGRESS.

Thursday September 5, 1929.
9.00 a. m.—Opening of the Bureau.
3.00 p. m.—Opening of the Congress by the President.
Friday September 6, 1929.
8.30 a. m.—Demonstration Meeting.
2.30 p. m.—Symposium on the "Aetiology and the Non-Operative Treatment of Glaucoma."
Saturday September 7.
8.30 a. m.—Papers.
2.30 p. m.—Papers.
Sunday September 8.
Excursions.
Monday September 9.
8.30 a. m.—Papers.
2.30 p. m.—Symposium on the "Geographical Distribution and the International Social Campaign against Trachoma."
Tuesday September 10.
8.30 a. m.—Papers.
2.30 p. m.—Papers.
Wednesday September 11.
Removal of the Congress from Amsterdam to The Hague (with sightseeing at Haarlem, Leiden, Delft or Rotterdam at Congressists' option).
Thursday September 12.
8.30 a. m.—Papers.
2.30 p. m.—Symposium on the "Diagnosis of Suprasellar Tumours."
8.00 p. m.—Banquet at the Kurhaus, Scheveningen.
Friday September 13.
8.30 a. m.—Papers.
11.00 a. m.—General Meeting.

4. ACCOMMODATION.

A committee for accommodation (situated at the Wilhelmina-Gasthuis, Amsterdam) will deal with all enquiries for housing. Those wishing to avail themselves of the assistance of this Committee are requested to state what type of accommodation (Hôtel, Pension, Private Houses, Homes) they require; rates for single rooms and breakfast vary from D.Fls. 15 to D.Fls. 2.50. Messrs. Thos. Cook & Son, Ltd., (in cooperation with the Comp. Intern. des Wagons-Lits), passage agents to the Congress (head office Berkeley Street, Piccadilly, London, W.I.,

branch office Vijgendam 10, Amsterdam and numerous other branches throughout the world), have offered to convey the members of the Congress to Amsterdam in the easiest and quickest way, individually or in parties, and to reserve their accommodation. For information application should be made to the head office or one of the branches.

5. Bureau of the Congress, Post, Telegraph, Exchange and Travel Offices.

In the Congress Building will be found:

(*a*) The Bureau of the Congress, where badges, programs, tickets for performances, excursions, meals, etc., as far as these have not yet been sent to the members, can be obtained as well as all information in connection with Congress matters.

(*b*) A Post and Telegraph Office.

(*c*) Exchange office.

(*d*) A Tourist Office.

6. Typist and Shorthand Writers.

Shorthand writers and typists will be available for taking down (in various languages) remarks in connection with the discussions.

7. Ladies' Committees.

These committees will attend to the requirements of the ladies present in Amsterdam as well as in The Hague. Further details in this connection will be given to the members in the program which will follow later on.

8. A Detailed Program.

A program of the Meetings to be held and further arrangements in connection with receptions, excursions, etc., connected with the Congress will be sent to the members of the Congress only in the summer of 1929. To those who have not received this program it will be handed at the beginning of the meetings.

A third and last invitation to attend the Congress will appear in ophthalmologic journals only in the spring of 1929.

In the interests of the organization of the Congress intending members are strongly recommended to send in their names at once, while applications for presenting of papers should be made as early as possible.

For the International Ophthalmological Council:

Van der Hoeve.
Marx.

For the National Committee of the Organization of the Thirteenth International Ophthalmological Congress:

Van der Hoeve.
Zeeman.

BEQUEST TO NEW YORK EYE AND EAR INFIRMARY

The New York Eye and Ear Infirmary will receive in excess of $500,000 under the will of Dr. Robert Gregg Reese, eye specialist who died on Oct. 18, 1926. He gave the bulk of the estate for life to twenty-two friends and relatives. On their deaths, the principal goes to the hospital "for the erection, furnishing and maintenance of a glaucoma pavilion."

DEATHS

Hubert Sattler.—Hubert Sattler died on Nov. 15, 1928, in Leipzig, in his eighty-fifth year. He was the son of a prominent artist of Salzburg, from whom he interited a talent for drawing and an appreciation for art. He was first

assistant to von Arlt in Vienna, in 1872, and was called to Giessen as professor of ophthalmology in 1877; later, he held similar positions in Erlangen, Prague and, finally, Leipzig.

Sattler was one of the important representatives of ophthalmology during the time of the most brilliant achievements in this specialty, and he developed the clinic in Leipzig into one of the most active centers in Germany. From this clinic have come many important scientific papers and many competent oculists, of whom five have become professors, Hess, Krückmann, Birch-Hirschfeld, Bielschowsky and Seefelder.

His main contributions were on "The Normal Anatomy of the Choroid," "Exophthalmic Goitre" and "Pulsating Exophthalmos," and his final work was a book on "Malignant Tumors of the Eye," which appeared in 1926 when he was 83 years of age. In 1907, he delivered the Bowman lecture before the Ophthalmological Society of the United Kingdom on "The Pathology and Treatment of Myopia."

He was one of the editor's of Graefe's *Archiv für Ophthalmologie*, and served for many years on the council of the German Ophthalmological Society.

Hjalmar Schiötz.—The death of Hjalmar Schiötz, in December, 1927, should not be recorded without some notice of his important contributions to ophthalmology. He was best known for his tonometer, a simple apparatus, which was demonstrated for the first time before the Norwegian Society, in May, 1905, after Schiötz had worked on it for three years. In a short time, it was universally in use and it is now an important part of the armamentarium of every ophthalmologist. As a young man in Paris, he worked with Javal in the Physiologic-Optical Laboratory of the Sorbonne. This resulted in the Javal-Schiötz Ophthalmometer, a model of which was demonstrated at the congress in Milan in 1880. This instrument has generally been spoken of under the name of Javal, but Schiötz undoubtedly played an important part in its development to which Javal himself referred in the Tenth International Congress at Lucerne, in 1904.

In 1881, Schiötz substituted heat as a means of disinfection in place of antiseptic solutions, and thereby introduced asepsis in Norway at an early period. Schiötz' suggestion of epilating the eyelashes before operations has not been generally followed. He was an enthusiastic advocate of the open method of treating wounds, introduced by his predecessor, Professor Hjort. He also constructed a self-registering perimeter, and a prismatic apparatus. In short, he was a man of original thought, well grounded in physics, with an exceptional bent for mechanics.

UNIVERSITY NEWS

Dr. John F. Dickson, who for ten years has been head of the Eye, Ear and Nose Department of the Medical School of the University of Oregon, has been appointed emeritus professor of ophthalmology, and the department has been divided into otolaryngology and ophthalmology departments. Ophthalmology is in charge of Dr. Frederick A. Kiehle. Dr. Joseph L. McCool has been appointed associate clinical professor of ophthalmology.

The General Education Board of the Rockefeller Foundation, New York, appropriated $15,000 to Washington University in 1927 to assist in securing the service of a full time professor of ophthalmology, and subsequently appropriated $680,000 to assist in organizing and conducting the ophthalmologic clinic on a university basis.

SOCIETY NEWS

Chicago Ophthalmological Society.—Dr. Edward B. Heckel, Pittsburgh, chairman of the Board of Trustees of the American Medical Association, was guest of honor at the annual meeting of the Chicago Ophthalmological Society, January 21; the subject of Dr. Heckel's address was "The Exclusive Use of Iced Normal Salt Solution in the Treatment of Gonococcic Purulent Conjunctivitis."

The Chicago Ophthalmological Society was addressed, February 18, at the Medical and Dental Arts Club, by Dr. Sanford R. Gifford, Omaha, on "Sympathetic Ophthalmia," and by Dr. Cyrus W. Rutherford, Iowa City, on "Complications in Cataract Extraction."

Société française d'Ophthalmologie.—The Forty-Second Congress of the Société française d'Ophtalmologie will take place in Paris at the Faculté de Médecine on Monday, May 13, 1929, and the following days.

The usual report will be presented by Dr. Aubaret, from Marseilles, on "Etiology and Treatment of Blepharitis." There will be an exhibit of optical instruments and instruments of ophthalmic surgery. Laboratories and hospitals will be open to visitors.

On Tuesday, May 14, the Trianon (Versailles) will be visited under the guidance of Mr. Maurichcau-Beaupré; this will be followed by a banquet in Versailles in the evening as usual.

Further information may be obtained from the secretary, Dr. René Onfray, 6 Avenue de la Motte-Picquet, Paris VII.

Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

Anatomy and Embryology

THE "MONGOLIAN EYE." H. GIFFORD, Am. J. Ophth. **11**:887, 1928.

The author gives the following summary of his study of the expression conveyed by the adnexa in 340 photographs of Chinese and Japanese and in 500 natives of Kioto and Yokohama.

The frequency among Mongolians of a palpebral fissure with the outer ends slanting markedly upward has been much exaggerated. It may be somewhat more common than among the members of other races, although statistics thus far collected do not indicate this, except those for the Kioto district of Japan. On the other hand, the occurrence of the same peculiarity among Aryans is much more common than is usually believed.

The most common and most striking characteristic of the "mongolian eye," and the one which has mainly given rise to the notion that there is such a thing, is the narrowness of the fissure, combined with and to some extent the result of a fulness and width of the space below the eyebrow and the margin of the fissure; this in turn is due to a rudimentary development of the frontal eminence.

The belief in the obliquity of the mongolian eye has been fostered by the traditional fondness of Mongolian artists and actors for this style of fissure. The actors increase or produce obliquity of the fissure by artificial devices; and they still further exaggerate the impression of obliquity by painting in an upward and outward extension of the eyebrows. Moreover, obliquity is readily noticed when it occurs in a narrow fissure of the surface of a flat face; while it easily escapes notice when worn in a recessed eye with a wide fissure.

Complete epicanthus is not, as a number of good authorities assert, a race characteristic of the Mongol. It occurs frequently among their children, but it generally disappears to a greater or less extent, as with other races, with the development of the bridge of the nose. A rudimentary epicanthus, however, in the shape of a fold extending from the skin of the upper lid obliquely downward and inward to the bridge of the nose, and persisting through life, seems to be much more common among Mongolians than among the members of other races; but this fold is so easily overlooked that, in comparison with the narrowness of the fissure, it contributes little to the peculiar appearance of the mongolian eye in the average view. While the fold and epicanthus are more common in childhood, the slant and the narrow fissure are more common in adult life.

THE EARLY DEVELOPMENT OF THE ENDOTHELIUM OF DESCEMET'S MEMBRANE, THE CORNEA AND THE ANTERIOR CHAMBER OF THE EYE. A. HAGENDOORN, Brit. J. Ophth. **12**:479 (Sept.) 1928.

The author reviews briefly previous views held concerning the development of the epithelium of Descemet's membrane and gives the following conclusions from his own studies.

1. The same principle governs the building up of the anterior segment of the eye in the whole group of the vertebrates.

2. This anterior segment of the eye is outlined at its first appearance by the ectoderm; the general scheme, which is more or less modified in the different species, is as follows: (*a*) Cornea—in the anterior vitreous, a membrane is formed, the cornea primitiva, posterior to which the endothelium grows in as the first mesodermal element of the future cornea; then the stroma cells grow in wedgewise between the cornea primitiva and the epithelium. (*b*) Pupillary membrane—in the anterior vitreous, an ectodermal membranous cell-free pupillary membrane is formed; in mammals, this membrane secondarily becomes cellular and vascularized. (*c*) Anterior chamber—the space between *a* and *b* is first filled up with the anterior vitreous or its substitute; the (real or virtual) anterior chamber is formed only by its atrophy.

3. The endothelium of Descemet's membrane is a mesodermal epithelium. The paper is fully illustrated.

W. ZENTMAYER.

Physiology

INVESTIGATIONS ON IMBIBITION. F. P. FISCHER, Arch. f. Augenh. **98**:41, 1927.

If a rabbit's eye be irrigated with distilled water, the cornea immediately becomes cloudy. The epithelium shows a loss of transparency, which continues into the parenchyma in finger-like processes. Finally, the endothelium becomes cloudy. This process may go on until the cornea is opaque. It is a reversible process, disappearing after thirty minutes, and it can be repeated. It is due to imbibition of water by the cornea, as shown by the increase in volume, the decreased solidity, the increased elasticity of the cornea and the complete reversibility of the process.

Normally, the cornea contains 76 per cent of water. In order to become cloudy, it must take up an additional 10 per cent. Hoffmeister showed that different salts change the property of imbibition of gelatin, and for each salt there is a specific concentration that prevents imbibition best. Hoffmeister showed that imbibition was prevented by anions best in the following order:

Citrate> tartrate> phosphate> sulphate> acetate

The cations show the following order:

Calcium> magnesium> ammonium> sodium> potassium.

Fischer found the minimal concentration of each salt that allowed the living cornea to become cloudy. He found that the molecular weight of the substance would not influence the results. In other words, the imbibition occurred in solutions of different molecular concentrations and, therefore, at different osmotic pressures. Experiments with different concentrations of sodium chloride, in which the same eye was repeatedly flushed with solutions of decreasing strength, showed that the epithelium protects the substantia propria from imbibition.

Similar experiments were undertaken to test the protective action of the endothelium. A canula was inserted in the anterior chamber connected with a buret and so arranged that the anterior chamber could be thoroughly irrigated with salt solutions of different concentrations. The results were essentially the same as in the experiments on the epithelium; it appeared, however, that the endothelium acted less efficiently.

The aqueous in a series of eyes was withdrawn, and the anterior chambers were filled with a similar amount of acid or alkali, ranging from thousandth normal to hundredth normal. Twenty-four hours later, these eyes showed gross changes of imbibition. These changes usually disappeared at the end of eight days. Eyes showing well marked imbibition were enucleated and sectioned. The most sig-

nificant changes occurred in the endothelium, and naturally they were the more marked the greater the concentration of either acid or alkali. There were no noticeable differences in action between acid and alkali. These experiments showed that the epithelium and the endothelium protect the substantia propria from swelling as long as their own normal imbibition is not exceeded, i. e., as long as the salt content of the fluid in the conjunctival culdesac or in the aqueous is not markedly diminished.

Fischer next investigated the permeability of the cornea to water and salts. The eye of a rabbit under deep urethane narcosis was irrigated with a 3 per cent solution of sodium citrate until the washings were entirely chloride-free. A small glass tube was then carefully placed on the cornea filled with 1 cc. of a 3 per cent solution of citrate, and every two hours samples of the solution were analyzed for chloride. With normal eyes, only the faintest trace of chloride came through after two hours. If, however, the epithelium was denuded, large amounts of chloride came through after two hours, and increasing amounts were found with each determination. Destruction of the endothelium alone was not followed by any change from the normal, unless the animal was killed. These experiments show that the epithelium definitely prevents the diffusion of chloride. Similar experiments were undertaken using concentrated sugar solutions, with which the cornea was bathed. The results were similar, inclining the author to believe that there is a greater impermeability of the cornea for salts than for water. In this respect, the living cornea acts as a semipermeable membrane. The author suggests that the chloride did not come from the aqueous but from the substantia propria of the cornea. The epithelium and the endothelium and not the substantia propria form an essential barrier to the diffusion of chloride even when there is a marked concentration gradient ranging from 0 on the outside to 0.65 per cent on the inside (aqueous).

Further experiments in which the diffusion of salt solutions were studied from the outside in showed that the penetration of salts in this direction took place much more readily than in the opposite direction.

The author concludes that the cornea is a semipermeable membrane which offers a considerable resistance to the passage of water. Chlorides are allowed to pass through in limited amounts from the outside in but are prevented from passing from the inside out. The obstruction to the transport of chloride is due to the epithelium and the endothelium. This property of selective permeability is lost by the cornea when it swells from imbibition.

Position of the Lids and Globe When the Eyes Are Closed. W. Reitsch, Ztschr. f. Augenh. **65**:251, 1928.

The position of the eyeball and eyelids during sleep is characteristic. Three types can be recognized, i. e., with the globes rotated upward, in the primary position and rotated downward. The usual illustration of the closed lids, either in sleep or of death masks, are incorrect; the author gives the usual incorrect schematic representation found in most textbooks, and then the corrected picture based on true anatomic relationships.

An understanding of the relation of the globe to the closed lids is of importance practically from the point of view of attempting sterilization of the culdesac prior to operation. If the culdesac is cleansed thoroughly and the lids are closed in such a way as to soil the conjunctiva from the skin surface of the lower lid, the culdesac becomes reinfected.

F. H. Adler.

Methods of Examination

EXAMINATION OF THE FUNDUS OCULI BY LIGHT OF LIMITED SPECTRAL RANGE. M. A. DOBSON, Am. J. Ophth. **11**:431, 1928.

The ophthalmoscope used is a modification of Salmonson's photographic instrument. A filter containing the dye aniline green naphthol B in glycerin is used. The spectrum obtained from light passed through this filter shows a broad green band, a narrow yellow band and a haze of blue-violet. The red rays are entirely cut off, and the heat rays are blocked out. Almost identical with this fluid filter, is a Kodak-Wratten celluloid filter cemented between glass no. 61 n. When the fundus oculi is thus viewed, the choroid is almost invisible, and the retina is colored a light pea-green. When the pigment of the fundus is not abundant, the retinal vessels are almost black, with a distinctly brown tinge. The vessels show a white central streak, most prominent in the arteries. The finer ramifications can be traced further. The nerve fibers, especially the arcuate, appear white and glistening. Exudations appear remarkably white and flocculent; connective tissue looks white. The fovea, which is very distinct, has an almost orange hue. The orange hue is most intense at the macula lutea and less intense as the boundaries of the fovea are reached. At the macula lutea, yellow pigment is in evidence; at the fovea centralis it abounds. In atrophic conditions, the macula lutea appears enlarged and sometimes has a crenulated edge. Preretinal exudations obliterate the color, and postretinal ones intensify it. Superficial detachments of the retina can be detected. The article is illustrated with colored plates.

AN INDELIBLE "3 OBECT" COMPARATIVE TEST FOR CENTRAL COLOR SCOTOMA; ALSO IN CASES OF CONGENITAL COLOR ABNORMALITIES. S. HOLTH, Brit. J. Ophth. **12**:309, 1928.

Holth describes the instrument that he introduced in 1905 and later modified. It consists of a black ebonite rule 16 cm. long, 2 cm. broad and 5.5 mm. thick. On each of the four sides of the rule are bored three round holes, 1 mm. deep, spaced 4 cm. apart. On one of the broad sides, a bright red celluloid disk is inlaid in each of the 15 mm. holes; on the other side, a pink disk is inlaid in each of the 10 mm. holes. The two narrow sides have three holes, each 3 mm. in diameter, which are filled with melted sealing wax which is ground after complete coagulation. On one side, the three holes are filled with light blue; on the other side, with pure yellow.

The patient sits with his back to the light, one eye covered. The rule is held horizontally 1.5 ft. (48.8 cm.) from the examined eye, with the upper edge of its surface inclined a little forward, to eliminate glare from the surface of the three objects. The test is designed for the detection of central and paracentral color scotoma due to retrobulbar involvement of the optic nerve caused by intoxication, inflammation or atrophy in the axial bundle of the nerve without visible ophthalmoscopic alterations — at most, the temporal part of the disk (in cases of axial atrophy) may be paler than normal.

W. ZENTMAYER.

Conjunctiva

ATYPICAL CONJUNCTIVITIS TULARENSIS; WITH CASE REPORT. C. P. CLARK, Am. J. Ophth. **11**:280, 1928.

The variations from the usual picture of the disease were: the patient was a boy, aged 7. The left eye was affected. The lids were swollen. There was conjunctival chemosis. An oval ulcer of the conjunctiva was situated at the

temporal side of the cornea. It was 4 by 5 mm. in length and breadth and 3 mm. deep. Its edges were indurated, and the center was necrotic. There was a firm, hard swelling over the ramus of the mandible, extending out as far as the auricle.

The treatment consisted in the application of 2 per cent mercurochrome-220 soluble ointment to the ulcer and the application of cold to the eyes. All symptoms had disappeared in about three weeks.

W. ZENTMAYER.

Cornea and Sclera

BILATERAL CYSTS OF THE CORNEA. L. W. FOX, Brit. J. Ophth. **12**:249 (May) 1928.

A girl, about 11 years of age, had a double advancement of the external recti for convergent strabismus, performed by another surgeon, with a partial improvement of the squint.

At the site of the anchorage of the advancement in the left eye, there was a V-shaped separation of the sclera, at the bottom of which the pigment of the choroid could be seen. The separation extended into the cornea giving it a steamlike aspect. In the right eye, a similar condition was much less marked.

The biomicroscope disclosed that the separation in the cornea was a cyst lying between Bowman's and Descemet's membranes. On either side of the V, blood vessels could be seen.

The condition being a progressive one, a keratome was passed into the cornea at the upper margin, on the temporal side of the steamy area. The point of the instrument entered the cyst. The lower margin of the steamy V was divided by scissors to cut off the blood supply. The edges of the wound were cauterized with trichloracetic acid. Later, a small white isolated scar between the center and margin of the cornea could be made out. The hernia of the ciliary body subsided, and the scleral opening closed.

W. ZENTMAYER.

TATTOOING WITH PLATINUM CHLORIDE IN HUMAN EYES. G. KRAUTBAUER, Klin. Monatsbl. f. Augenh. **80**:372 (March) 1928.

In reporting four cases, Krautbauer confirms his contention that there is no pain after the cessation of the action of the local anesthetic, no irritation and satisfactory staining. The author recommends platinum chloride and hydrazine hydrate. He expects reasonably lasting results, judging by his animal experiments.

CHRONIC KERATITIS FILIFORMIS DUE TO SCANTY TEAR-SECRETION. A. BETSCH, Klin. Monatsbl. f. Augenh. **80**:618 (May) 1928.

In referring to the article of Schoeninger (*Klin. Monatsbl. f. Augenh.*, 1924, vol. 73), the author reports two similar cases: in the first case, the patient was free from rheumatism but there was diminished secretion of tears. Pilocarpine produced perspiration and salivation, but failed to stimulate the flow of tears. In the second case, the patient showed inactivity of the tear gland, a disturbance of salivation and periodic swelling of the parotids during the menses. The tear glands were of normal size in both patients; both were women; both had filaments in the lower periphery and in the corneal center. The author cites cases of dysfunction of the tear glands and the salivary glands reported by Deutschmann and Fuchs, in which no mention was made of the corneas. The same glands are affected in Mikulicz's disease and botulism. Betsch points out that climacteric changes must be considered and a

connection sought with ovarial function. No relation with gout or arthritis was found in the cases of Betsch or Schoeninger, except one. Insufficient secretion of tears, in his opinion, is the cause of the formation of filaments in his cases. The filaments may be missing in the initial stage, while fluorescein reveals a "stippled" condition of the epithelium. One eye may present filaments; the other stipples. In one case, the filaments developed in one eye three years later than in the other. The function of the tear glands was measured with Schirmer's blotting method.

TATTOOING, AFTER KNAPP. F. KUGELBERG, Klin. Monatsbl. f. Augenh. **80**:813, 1928.

Satisfactory results were obtained with a 2 per cent solution of gold chloride, after a number of failures. Kugelberg now uses it after a few seconds' action of a 1 per cent solution of soda and follows it up with a 1 to 2 per cent solution of tannic acid. This procedure is often combined with an optical iridectomy.

Axenfeld, in a footnote, states that this combination, avoided by him formerly, is possible in applying Knapp's method, under certain precautions.

CHANGES OF THE CORNEA AND CONJUNCTIVA OWING TO INSUFFICIENT TEAR SECRETION (FILIFORM KERATITIS). E. ENGELKING, Klin. Monatsbl. f. Augenh. **81**:75 (July) 1928.

Wagenmann was the first to mention desiccation as a cause of filiform keratitis. This idea was supported by Schoeninger (*Klin. Monatsbl. f. Augenh.* **72**:208, 1924) and Betsch (ibid. **80**:618, 1928). They proved that an insufficient function of the tear glands is the causative factor. Engelking arrived at the same conclusion. He reports two cases both of which occurred in men. Most of the other cases reported concerned women at the age of the menopause.

CASE 1.—A man, aged 25, developed indolent cirrhotic tuberculosis of both lacrimal glands; he had never suffered from any disease of the eyes, nor had he had arthritis. The globes were not involved. Both tear glands and the adjoining portions of the fornix were removed. The operation was followed immediately by a typical development of filiform keratitis of both eyes. There was a complete absence of tear secretion. Circumcorneal injection was noted. The conjunctiva appeared dark red and dull. The corneal epithelium was uneven and stippled; it showed numerous defects at the central parts of the cornea, mostly round in shape; some of them were in a state of superficial infiltration. Filaments had formed on the corneas, chiefly at the peripheries. The sensitiveness of the corneas was reduced owing, presumably, to the changes of the epithelium. Slimy, stringy secretion was found in the conjunctival sacs, a characteristic symptom of an insufficient flow of tears. The course was chronic and uninfluenced by treatment. In the writer's opinion lack of moisture is the sole cause of the condition described. Examination with Schirmer's blotter test is considered essential, because many eyes thus affected do not on mere inspection give the impression of being dry.

CASE 2.—A man, aged 38, underwent an operation for empyema of the left frontal sinus in 1918. This was followed by slight ptosis and faulty upward motion of the globe; lagophthalmus was not present. Unbearable pain made the removal of the first branch of the trigeminus necessary in 1921 and the extirpation of the gasserian ganglion in 1926. The left eye became irritated, and the flow of tears stopped a few weeks after the latter operation; the cornea became completely insensitive and lusterless; small infiltrations occurred and, later on, a large epithelial defect formed in the center of the cornea, which was slow in

healing. Numerous dotted defects of the epithelium developed; stringy secretion appeared in the conjunctival sac; some of the strings measured 5 cm. At no time were filaments noticed. Schirmer's test showed 16 mm. of the blotter moistened in five minutes in the healthy right eye, while the blotter remained dry after six minutes in the left eye. Improvement had not been obtained at the time of publication.

The fact that at no time were filaments observed leads the author to think that they might have been temporarily present, but overlooked, soon after the extirpation of the ganglion at the time when the eye was irritated. The changes of the cornea cannot be considered as sequelae to the neuropathic keratitis, but rather as the consequence of the operation, which led to a destruction of the function of the trigeminus and that of the secretory fibers of the tear glands. Extirpation of the ganglion, which is known to cause the cessation of crying, will not inhibit the physiologic process of moistening the eye. The eye remained dry in this special case owing to a lessened activity of the conjunctiva, which was caused by some unknown factor. The function of the conjunctiva, therefore, should be carefully examined prior to each operation of this type; individual differences may exist. The same diagnostic means should be used in cases of corneal herpes.

K. L. Stoll.

Lens

The Calcium Content of Blood Serum in Senile Cataract. A. Pellathy and S. Pellathy, Klin. Monatsbl. f. Augenh. **79**:198, 1927.

The authors review the theories of the etiology of cataract, and point out that many investigators are convinced of a disturbance in the glands of internal secretion, especially in a diminished function of the parathyroids. It is recognized that the function of the parathyroid gland is concerned with calcium metabolism. A removal of the parathyroid gland causes a fall in the calcium content in the blood serum, with resultant tetany and the development of zonular cataracts. These authors are of the opinion that if a hypofunction of the parathyroids is the cause of senile cataract, a diminution must be found in the calcium content of the blood serum of such patients. They have examined, therefore, forty-eight patients, who ranged from 45 to 75 years of age, all of whom had well marked senile cataracts.

The calcium content of the blood serum was determined by the Kramer-Tisdall method. In normal control cases, they found the calcium values ranging from 9.8 to 11.7 mm. per hundred cubic centimeters. In the forty-eight cases of cataract, the values did not deviate from the normal. There is not, therefore, a demonstrable change in the calcium metabolism present in such patients.

F. H. Adler.

Roentgen Cataract; Its Origin and Morphology: Case Report. W. Rohrscheider, Klin. Monatsbl. f. Augenh. **81**:254 (Aug.-Sept.) 1928.

The author accepts Schnyder's term "ray cataract" (Strahlenkatarakt) for a morphologically definite type of opacities of the lens, which are acquired as a result of heat rays. A subdivision is the cataract of glassblowers. According to Schnyder, the changes in the lens consist of: (1) the formation of lamellae on the anterior capsule of the lens, i. e., detachment of the zonular lamella; (2) posterior polar cataract, located in the pupillary area, thickest in its central axis and thinner toward the edge; it is a positive meniscus.

A cataract of this type was found in both eyes of a shoemaker, aged 23. His sight had been good; he had used the right eye for shooting. The origin of the cataract was traced to roentgen treatments for fibroma of the nasopharynx, which

was cured five years prior to the onset of the decrease of vision. Exposures had been made on the upper jaw on the right side and on both cheeks; he had received four courses of treatments, each consisting of four exposures in ten day intervals. No other kind of rays had been used except the skin erythema dose (*HED*), with 0.5 mm. zinc filter and a focus distance of 22 cm. from the skin. A brownish discoloration of the lid of the right eye was noticed a week after the last treatment, but no loss of hair of the brows or of the ciliae had taken place. Both eyes had been protected with lead-foil covers; in the author's opinion, the shifting or motions made by the patient during the exposures might have permitted the injury done to the patient's eyes. Furthermore, the author considers the possibility that secondary radiation, emanating from the immediate surrounding of the lead-foil covers, might have caused lesions of the eyes, if the cone of rays, during repeated exposure, passed closely enough to the eyes.

He quotes Scheerer, who thinks that cataracts may be caused by small quantities of rays which are sufficient for epilation treatments. The present case, in accordance with the roentgen-ray cataracts, but at variance with the glass blowers' cataracts, showed no detachment of the zonular lamella. Ampule-shaped enlargements of the conjunctival vessels were present in the right eye; they are considered typical in roentgen-ray lesions since the publication of the report of Birsch-Hirschfeld. This case showed a number of symptoms in common with the glass-blowers' cataract, as well as the unusual presence of large vacuoles in the anterior and posterior portions of the lenses. In a case published by Horay, cataracts were likewise noticed five years after roentgen treatment, although the eyes had been properly protected. A complete bibliography is appended.

Uvea

ESSENTIAL PROGRESSIVE ATROPHY OF THE IRIS. J. H. WAITE, Am. J. Ophth. **11**:187 (March) 1928.

In an unmarried Jewess, aged 22, the pupil of the right eye was drawn down nasally, while the root of the iris was beginning to show atrophy up and out. Corrected vision was 20/50. The fields, tension and papilla were normal. Eight months later glaucoma developed. The tension was 43 mm. (Schiotz). A Lagrange sclerectomy was performed, and during the subsequent four years the tension was never higher than 12 mm. With the wasting of the iris, which had not been checked by the operation, the filtration locali were larger and of greater number. There never had been any active or old inflammation, the only abnormality being fine pigment points on the posterior surface of the cornea which simulated Krunkenberg's spindle. The anterior chamber in the zone of the pupil had always been of normal depth, and this iris had always been anchored at 5 o'clock, at first by a narrow ectropion and finally by a broad synechia, which had drawn the pupil to within 1 mm. of the limbus.

Despite the advanced atrophy of the iris, it still reacted to light. From the beginning, the maximum atrophy had been opposite to the synechia and involved all the layers.

The author believes that the primary changes were in the mesodermal layers and that the conditions manifested as a local contraction of this layer. The atrophy may be explained by the mechanical stretching of the iris, which may occlude the lumen of the stretched radial arteries of the iris, and cut off nutrition from the part which undergoes atrophy. The glacuoma may be explained by the destruction of the capillaries of the iris, which he believes is the most important outlet of the aqueous.

W. ZENTMAYER.

OPHTHALMOSCOPIC STUDIES OF THE PERIPHERY OF THE FUNDUS IN MYOPIC AND SENILE EYES. K. REHSTEINER, Arch. f. Ophth. **120**:282 (April) 1928.

Choroidal lesions in the periphery are more common in myopic than in non-myopic eyes. The higher the degree of myopia, the more frequent they are. In cases of anisometropia, only the myopic eye shows the lesions. Old people have the same type of lesion in the periphery of the fundus, but not so commonly as do myopic patients. The senile and the myopic lesions are similar, white to yellowish white, of various sizes and usually combined with some proliferation of pigment. Sometimes, even black lesions are found. Several of these lesions may run together, forming a band. The author attributes them to degenerative processes just as are the myopic changes in the posterior pole of the eye. Exogenic factors, such as close work, inflammation and ectasia, do not account for these lesions. The only "biologic explanation" is homochronous heredity. The author is opposed to the opinion that they are of inflammatory origin (Meller, Loewenstein, Pressburger), and to the opinion of Hanssen that the general distention of the myopic eyeball causes peripheral choroiditis. Following the theory of Vogt, he bases his conception on heredity.

P. KRONFELD.

Glaucoma

CLOSURE OF THE DRAINAGE ANGLE. M. GOLDENBURG, Am. J. Ophth. **11**:290, 1928.

Th author refers to a former paper in which he presented a theory as to the mechanism of normal intra-ocular pressure based to a large extent on a newer knowledge of the anatomy and the physiology of the capillaries, placing much importance on the part played in this mechanism by the extrinsic and intrinsic muscles of the eyeball and their motor nerve supply. The theory he now presents as to the closure of the drainage angle is based on the same phenomena in an abnormal state. He summarizes as follows: Closure of the drainage angle is the result of mass movement of the ciliary body, ciliary processes and iris. This mass movement is exhibited in all directions, but owing to the acute angle formed by the cornea and the iris, the cornea being the more resistant part, the iris is pushed against the cornea.

The mass movement of the uveal structures is the result of a congestion or swelling secondary to abnormal dilatation of the capillaries that go to form the main portion of these structures. The abnormal dilatation and congestion of these capillaries are the manifestation of their reaction to a toxic or irritant substance which primarily has found its way into the blood stream.

W. ZENTMAYER.

Retina; Optic Nerve

FAMILIAL ROSETTE FIGURE OF THE MACULA. A. L. BROWN, Am. J. Ophth. **11**: 190, 1928.

The author describes a macular lesion which he found in four members of a family of five children. The eyes of the parents were normal. In all four cases, the physical examination showed normal conditions.

The macular lesion was bilateral. It seemed to be composed of deposits not unlike a red raspberry in setting and color. Around the periphery of this figure, a few irregular spokes extended a short distance into the surrounding retina. The figure was raised and glistening. The vision was considerably reduced.

W. ZENTMAYER.

ANGIOPATHIC RETINAE TRAUMATICA (PURTCHER) WITH SOME REMARKS ON PIGMENT MIGRATION. C. H. CHOV, Brit. J. Ophth. **12**:570, 1928.

A boy, aged 16, following a blow on the right eye and side of the face by a ball, noticed a loss of vision in the right eye lasting about one hour. After that the vision was cloudy. He was not rendered unconscious. One week later the vision was 4/30. On the superior and temporal sector of the fundus, there was a brushlike, whitish, opaque area extending from the edge of the papilla along the course of the superior temporal vessels and situated beneath them. When this area was observed about five weeks after the injury, it contained numerous aggregations of pigment of varying size, more or less in the form of a network. They were grayish, and were located in the outer retinal layers. Over this area, the vitreous appeared to be filled with fine opacities. The macular region was not involved. There was a relative central scotoma and an absolute paracentral scotoma continuous with the blind spot. The roentgenogram of the skull showed nothing abnormal.

According to the author, the case was of special interest from the fact that it resulted from a direct concussion on the orbit. He explained the mechanism by which the ocular changes were brought about. In all but one other case reported, the white patch formed a single, continuous area. An unusual feature was the migration of pigment, which, he assumed, came from the pigment epithelium of the retina. He discussed the various ways by which the pigment could migrate into the retinal layers. The paper is accompanied with illustrations and bibliography.

UNUSUAL CASE OF MACULAR DEGENERATION. F. W. LAW, Brit. J. Ophth. **12**: 646 (Dec.) 1928.

Macular degeneration was observed in a widow, aged 46, whose vision had been good without glasses up to six years previously, and with glasses until two years previously. Since then there had been a gradual deterioration in both eyes. The refraction in both eyes was $+3.00 = +0.50c$ ax $180°$. In the right eye the disk was normal. In the region of the macula there was a vaguely defined circle, of a diameter of 1.5 disk diameters. This circle could with difficulty be seen in its entirety and had a pale grayish tinge. The upper part of this area was depressed. Fine vessels, which crossed its edge, dipped down into the area. The lower part was well defined, being of a markedly lighter color, and resembled a colorless or yellowish subhyaloid exudate. That it was due to the fluid occupying the lower segment was proved by causing the patient to lie on her right side for two hours, at which time the lighter area was found to have altered its position and to be lying in the temporal segment. The rest of the fundus was normal. In the macula of the left eye, a small, irregular, dark gray area was found, presumably pigment.

The vision was 6/60 in the right eye and 6/24 in the left eye (corrected). The visual fields were full, with no central scotoma in either field. On the Bjerrum screen, the white fixation disk, of 10 mm., was seen with the right eye as irregular in shape, the size of a crown, with an irregular black center from which black spokes radiated. In the left eye its appearance was similar, but was smaller and the spokes were less marked. The color vision was normal.

The removal of infected teeth and general treatment did not cause any change in the ophthalmoscopic appearance or in the vision. The author considered the condition to be a decolorized subhyaloid hemorrhage in the region of the right macula, with pigmentary degeneration of the left macula.

W. ZENTMAYER.

Neurology

PAPILLEDEMA IN ACUTE SYPHILITIC MENINGITIS AND MENINGOENCEPHALITIS. R. L. GLASS and P. H. GOWERS, Am. J. Ophth. **11**:3, 1928.

The conclusion drawn by these authors from the study of seven unquestionable cases of acute syphilitic meningitis or meningo-encephalitis is that papilledema or neuroretinitis is a frequent accompaniment of these conditions. It is usually moderate and, as a rule, disappears under treatment. Its presence is likely to confuse the neurologic diagnosis. Complete serologic studies are therefore essential in acute nervous diseases accompanied by choked disk.

W. ZENTMAYER.

Orbit; Eyeball Accessory Sinuses

VOLUNTARY PROPULSION OF BOTH EYEBALLS. H. FERRER, Am. J. Ophth. **11**: 883, 1928.

A Cuban, aged 20, possesses a unique voluntary ability to dislocate his eyeballs. He has been practicing it since his fifth or sixth year. The eyes have always been proptosed. He can, at will, dislocate both eyeballs simultaneously, or either eye separately, straight forward for a distance of 9 mm. When but one eye is dislocated, the other eye is closed. The eyes can be kept proptosed without discomfort or reduction of vision for several minutes and then returned to their normal position without difficulty.

The author believes that this is accomplished by a contraction of the two oblique muscles simultaneously with a relaxation of the four recti. When more than one half of the eyeball has been dislocated from the orbit, the patient contracts the orbicularis behind the equator of the globe and holds it in position. To return the eye into the orbit, he relaxes, first, the orbicularis and then the oblique.

W. ZENTMAYER.

Tumors

A CASE OF SARCOMA OF THE IRIS. B. CHANCE, Am. J. Ophth. **11**:859 (Nov.) 1928.

In a man, aged 42, a small, round mass was first noticed about twenty-seven years previous to examination on the iris of the left eye, but it had not shown any increase, except for a short time. It was situated in the middle third of the lower half of the iris and filled this portion of the chamber, reaching almost to the pupillary border. It was yellowish-brown.

A portion of the iris, including the growth, was removed. As a microscopic study by DeLong showed it to be a mixed cell sarcoma, the eyeball was enucleated eighteen days later. Tumor cells were not found in the other tissues of the eye. There was no recurrence. The patient was in good health more than five years after the operation.

PRIMARY MELANOSARCOMA OF THE IRIS. C. A. YOUNG, Am. J. Ophth. **11**:864 (Nov.) 1928.

The patient was a man, aged 30. One year previous to the appearance of a small growth at the 3 o'clock position of the iris, the eye had been struck by a bunch of keys. Eight years later, when seen by the author, the growth almost completely filled the anterior chamber. It was brownish and contained a good deal of pigment. The tension was 50 mm. of mercury (McLean).

The eyeball was enucleated. The microscopic study by DeLong showed it to be a melanotic sarcoma of the spindle cell type. There was neither local nor general metastasis two years later.

A Case of Neurofibromatosis of the Right Orbit. M. L. Hine and R. B. H. Wyatt, Brit. J. Ophth. **12**:513, 1928.

A man, aged 26, said that the upper lid had been enlarged since he was 8 years of age. When he was 11 years of age, the diagnosis was made by Hancock from a biopsy. The lid was enormously thickened and overhanging, causing ulceration of the skin of the lower lid. There was involvement of the skin of the right temple and occiput. The cornea was leukomatous and the eye blind. There was an incurable conjunctivitis.

The eyeball was removed along with the conjunctiva of the socket. Part of the upper lid and the margin of the lower lid were excised. The lids, optic nerve, orbital tissues and ciliary nerves showed characteristic fibromatosis. In the cornea, immediately beneath the anterior limiting membrane, were groups of elongated cells forming an almost complete layer. Near the limbus, these cells were more distinct, and there were numerous thickened nerves. There were taken to be hypertrophied nerve-supporting tissue. The choroid did not show any hypertrophied end-organs, as described by Collins. The article is illustrated.

W. Zentmayer.

Injuries

Subconjunctival Lens Dislocation. J. Fejer, Am. J. Ophth. **11**:354, 1928.

In both cases, the injury resulted from the eye's being struck by a cow's head. The rupture in the sclera in one case was upward and a little to the nasal side; in the second it was 3 mm. directly up from the limbus. In both, the lens was beneath the conjunctiva, and the iris was prolapsed. The lenses were removed, the prolapsed iris tissue was excised and the conjunctival incision sutured. In one case, the vision was 5/10, and in the other the immediate vision allowed counting of the fingers at 1 meter. The usual outcome of such injuries is enucleation.

Aseptic Serous Meningitis Following Intra-Ocular Foreign Body. F. W. Law, Brit. J. Ophth. **12**: 644 (Dec.) 1928.

The patient was a youth, aged 17. A piece of steel had perforated the eyeball and lodged in the bottom of the vitreous. There was a wound of the cornea, with a large hole in the iris in a corresponding position, the ragged margins of which were all directed forward as though swept that way by a gush of vitreous into the anterior chamber. The anterior chamber was of normal depth and contained vitreous. The lens was clear. The fundus was normal. The vision was 6/5.

The foreign body was removed at once, with the aid of a Haab magnet and small hand magnets through a keratome incision. Two days later, there was evidence of infection with orbital involvement. The globe was eviscerated that night. Pus was present in the vitreous. A rubber drain was inserted. The patient was drowsy and had headache. Kernig's sign was positive on both sides. The head was retracted. The temperature was 101.6 F. The spinal fluid was under pressure. Twenty-five cubic centimeters of clear colorless fluid was drawn off before the pressure was normal. A culture of the aqueous revealed only *Staphylococcus albus*. The spinal fluid was normal. As further symptoms of meningitis

developed, a second spinal puncture, with the withdrawal of 10 cc. of fluid, was done. From then on, the local and general symptoms gradually subsided.

The author considers the case one of aseptic serous meningeal effusion, comparable in a sense to pleural effusion which may occur in conjunction with an abscess of the liver, and the ascites with intestinal new growth.

W. ZENTMAYER.

Operations

CORRECTION OF PTOSIS BY FASCIA LATA HAMMOCK. G. S. DERBY, Am. J. Ophth. **11**:352, 1928.

The operation described by Derby is a modification of Machek's operation, using fascia lata as suggested by Lancaster. An incision is made through the skin down to the tarsus, along the edge of the lid just above the lashes. The upper lip of the skin is dissected back far enough to allow the hammock of fascia lata to fit in under it and be covered. Two tunnels are made under the skin to points above the eyebrow. A piece of fascia lata from 7 to 9 cm. long and 1 cm. wide is then secured. A mosquito clamp has already been passed downward through each lid tunnel. An end of the fascia lata is then placed in each clamp and the fascia is drawn up into position. With full curved needle, the fascia on one side is sutured with one or more deep stitches of silk or catgut to the frontalis as close to the periosteum as possible. The fascia lata hammock is then pulled tight by the loose end, and that is then sutured to the frontalis. One or two small skin stitches may be necessary. The ends of the fascia lata may be allowed to protrude, or they may be buried.

W. ZENTMAYER.

Comparative Ophthalmology

THE REFRACTION OF ONE HUNDRED AND FIVE DOGS WITH OBSERVATIONS ON SENILE CHANGES IN CANINE EYES. ROBERT KISTLER, Klin. Monatsbl. f. Augenh. **80**:181, 1928.

The refraction of the eyes of 105 dogs was determined by Vogt after full mydriasis had been obtained by homatropine and cocaine. The corneal refraction was obtained by the Javal ophthalmometer. The total refraction was estimated by an electric ophthalmoscope. By this means, the mean refraction was found to be $+0.415$ diopters.

Myopia was seldom found. In those eyes in which it occurred, it was due to lenticular myopia, usually from the presence of a lens with double focus. The corneal refraction depended on the age and on the general body size of the race. Young animals had a greater corneal refraction. The following senile changes were noted: cataract, lens with double focus and a degeneration of the posterior pole of the fundus similar to that in human senile macular degeneration.

F. H. ADLER.

General Disease

VISUAL FIELD CHANGES IN ARTERIOSCLEROSIS. W. W. WEEKS and M. LANDIS, Am. J. Ophth. **11**:203, 1928.

The authors studied the changes in the visual field in retinal arteriosclerosis. They found reversal of the red and the blue fields occurring far more often from this cause than from any other. The blind spot is enlarged for blue only. The field for blue is markedly contracted, often falling within much narrower limits

than the field for red, which remains normal. The peripheral field for white may be contracted.

The defect in the blue field indicates choroidal involvement due to impaired nutrition.

W. ZENTMAYER.

AN EXAMINATION OF THE FIELDS OF VISION IN THE LAST WEEKS OF PREGNANCY. A. L. MCCURRY, Brit. J. Ophth. **12**:177 (April) 1928.

The author points out that the view that the optic chiasm lies on the optic groove of the sphenoidal bone is now regarded as incorrect. He quotes Schaeffer's observations that in 96 per cent of 125 fresh specimens the optic chiasm lay wholly or partly over the diaphragm, sellae and underlying hypophysis, and in 79 per cent of these instances the anterior and often the greater part of the chiasm had the diaphragm hypophyseal relation, the dorsal and lesser part projecting variously over and behind the dorsum sellae; in 12 per cent the entire chiasm lay over the diaphragm and the subjacent hypophysis; in 5 per cent the dorsal part of the chiasm rested over the diaphragm, the anterior part resting on the chiasmatic sulcus, and in 4 per cent of the bodies the entire optic chiasm was behind the diaphragma sellae, lying on the dorsum sella and projecting behind it.

He concludes, therefore, that the optic chiasm can be affected by an enlargement of the pituitary gland which is sufficiently great to press on the chiasm and so interfere with its function. The pituitary gland increases during pregnancy in both volume and weight. The amount of bitemporal contraction depends on (1) the amount of hypertrophy of the pituitary gland, (2) the amount of compression of the chiasm and (3) the anatomic peculiarities of the chiasm, sella and diaphragma sellae.

He quotes Finlay, Carvill, Fewell, Lohlein, Beckerhaus and others, who show a wide variation in their observations on the changes of visual fields toward the end of pregnancy.

The author examined the fields of vision of seventy pregnant women calculated to be in the last month of their pregnancy. The average time of the examination was fifteen and nine tenths days before parturition. They were mostly of the laboring class. The ages varied from 17 to 43. Forty-three were pregnant for the first time, 15 for the second, 5 for the third, 4 for the fourth, 2 for the fifth and 1 for the seventh. Only three had subjective symptoms of disturbed vision.

The fields were taken on a perimeter with a radius of 32 cm., with few exceptions by daylight, and with test objects of varying sizes. The fields of twenty patients were examined with a test object of 10 mm. for white, blue, red and green. As only 2 of the 160 fields taken showed any change, which was within bounds, it may be assumed that the fields of these twenty patients were all normal. Thirty patients were tested with 5 mm. objects. Contraction was not present in any of the patients. Scotomas were not found. Twenty were tested with a 2 mm. white test object. Thirteen of these gave absolutely normal fields. Four of the remaining seven who showed contraction had one field only contracted.

He thinks one may assume from these figures and from those given by Beckerhaus, who examined 150 cases, that bitemporal contraction of the fields of vision does not occur in pregnancy. He suggests that in view of the rarity of the observervation of the contraction of fields in Europe with the frequency of positive results in America, it might be well to ascertain the following points: (1) if some racial peculiarity of the formation of the skull or the development of the pituitary gland, (2) if retinal fatigue or (3) if even suggestion could account for this diversity of results by skilled observers.

S. GIFFORD.

Pharmacology

THE RAPID EFFECTS OF MYDRIATICS IN INFLAMMATION OF THE ANTERIOR SEGMENT OF THE EYES, RAPID DISAPPEARANCE OF INFLAMMATORY PRECIPITATES AND OF ANTERIOR AND POSTERIOR BEDEWING OF THE CORNEA. M. HANDMANN, Klin. Monatsbl. f. Augenh. **79**:323, 1927.

Attention is called to the lack of a satisfactory explanation in textbooks of pharmacology or ophthalmology of the action of atropine in acute ocular inflammations. The usual explanations of such action, based on putting the iris and ciliary body at rest, the prevention or breaking up of synechia, the production of slight anesthesia of the cornea and iris and the dilatation of the blood vessels in the posterior segment of the globe, do not seem sufficient to explain the immediate improvement in cases of beginning ocular inflammation observed on the instillation of atropine.

This author has constantly observed that in many cases (not all) in from thirty to sixty minutes after the instillation of atropine there occurs a rapid clearing up of the fibrin deposition and of the bedewing of the anterior segment of the eye. The author has satisfied himself that this is not merely an optical effect, and, therefore, a deception, which arises because the pupil has been dilated, since:

1. In cases in which synechias were present and the pupils failed to dilate, the same improvement could be noted.

2. Preformed precipitates became more prominent after the bedewing had disappeared.

3. By observations with the slit lamp, he could see occasional flecks of fibrin, which were attached to the pupillary border, vanish under the influence of the atropine, "like snow flakes in the sun."

4. In cases of so-called kerato-iritis, he could see the bedewing vanish, while the deep lying corneal infiltrate became more apparent and easier to outline.

5. The bedewing of the corneal epithelium could be seen to vanish when oblique illumination was used, which situation is analogous to the disappearance of the corneal edema in glaucoma after the instillation of miotics.

6. In a few cases, the fibrin disappeared in streaks or formed a small collection on the floor of the anterior chamber.

7. A local disappearance of the fibrin could be noted occasionally where the pupil dilated irregularly owing to synechia.

8. Dilated blood vessels could be seen on the anterior surface of the iris after the disappearance of the corneal bedewing.

The same effects were observed when scopolamine and homatropine were used. Control experiments with boric acid solution, dilute sublimate solution and pure water or miotics gave negative results.

The author points out the fact that the iris forms a water-tight contact with the lens, in the sense first proposed by Hamburger, and he believes that the disappearance of the fine precipitates under the influence of atropine is due to the dilatation of the pupil, which allows fluid from the posterior chamber to enter the anterior chamber. He believes that the rapid disappearance of the fine fibrin precipitates can be explained only in this way. They either are dissolved by the fluid coming from the posterior chamber or are washed out. In addition to this, he agrees that atropine may have an influence in preventing the blood vessels from leaking protein.

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(Continued from page 296)

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PROF. A. VON SZILY, *Chairman*

PULSATION OF THE CORNEA, BLOOD PRESSURE, AND INTRA-OCULAR PRESSURE. DR. THIEL, Berlin. (According to experiments done in cooperation with Dr. Carl Müller [Phys. Techn. Reichanstalt, Berlin] and Dr. Wilhelm Müller, Berlin.)

Pulsatory movements of the cornea have thus far been observed in human beings only when the cornea was partially (corneal scars, descemetocele) or wholly (keratoconus) thinned out. A determination of which of the two intra-ocular systems of blood vessels is principally concerned with the origin of the corneal pulse and which factors greatly influence the course of this pulse wave, can furnish important conclusions as to the changes in the intra-ocular system of blood vessels in the general disturbances of circulation and pathologic hypertension.

The pulsations of the cornea can be considered as the result of a rhythmic change in the volume of the eyeball which is due to the waves of blood entering the inner eye with the heart beats. This pulse wave can be measured by determining the volume and pressure of the pulse.

1. To determine the volume of the pulse a parallel double mirror system is constructed through which it is possible to determine only the diffractions of the reflected ray which originate when a glass (resting on the cornea) is turned against another one of parallel position (through a change in the corneal curvature).

2. To determine the pressure of the pulse, an apparatus is constructed according to the principle of the Wheatstone bridge. This apparatus resembles outwardly as well as in mass and weight the Schiötztonometer. On the sliding piston rests a metal disk which at the movements of the cornea rhythmically cools off the nickel wires which are heated by an electric current. Through this cooling, a change in the resistance of the nickel wires is caused and is measured by a galvanometer.

Simultaneously with the observation of the corneal pulse the carotid pulse and the fluctuations of breathing were also noted. The curve of the corneal pulse is in the form of a wavy line. The movements of the cornea take place in rhythm with the pulse beat. Respiratory fluctuations of the blood pressure can also be seen in the curve of the corneal pulse. Diseases of the retinal vessels (emboli, thrombosis of a vascular branch) have no influence on the course and amplitude of the corneal pulse. When the volume of the pulse is determined, the amplitude of the curve of the corneal pulse stands in inverse relation to the intra-ocular pressure; when the pressure of the pulse is determined, it is at its best when the pressure exercised on the vessels of the inner eye exceeds the diastolic pressure in them.

The speaker recommended a determination of the corneal pulse as a substitute for oscillometry. It is probable that through further investigations, knowledge of the functions of the vessels of the choroid whose pulse limits the corneal pulse will be furthered.

AN ANESTHETIC CAUSING LOWERING OF THE PRESSURE FOR A LONG PERIOD. DR. K. ASCHER, Prag.

In the Indo-Chinese drug gasu-basu, there is an alkaloid which in its chemical and pharmacologic properties greatly resembles erythrophlein and which causes anesthesia of the cornea of long duration. Aside from this property which has been mentioned in the literature as rarely observed, Ascher found a lowering of the intra-ocular pressure which lasted from a day to a week after the instillation and subconjunctival injection of the alkaloid in rabbits, dogs and man.

EFFECT OF MIOTICS ON THE GLAUCOMATOUS EYE. DR. SCHMIDT, Bonn.

The speaker's earlier experiments are mentioned in which he determined that in healthy patients suffering from glaucoma an atypical course of the "drinking test" (Trinkversuch) was found. Therefore, a general disturbance of the capillaries in the endothelium was found in glaucomatous patients. In the eye, the general disturbance was expressed in the rise of intra-ocular pressure in the drinking test. Nine patients suffering from untreated bilateral simple glaucoma were subjected to a drinking test. They showed the typical rise in pressure during the drinking test. After this, pilocarpine was administered unilaterally, and on the next day a second drinking test was given. A curve of the results was made. It was shown that in the eye treated with pilocarpine there was no rise in pressure after the drinking test. This agrees with earlier experiments on animals which showed that the pressure lowering effect of pilocarpine is a pure effect on the vessels, since the process of increase of plasma takes place principally in the capillaries of the endothelium and the increase of plasma in the drinking test leads to an increase in pressure.

TREPHINING OR CYCLODIALYSIS. DR. VON GRÓSZ, Budapest.

Indication for iridectomy in inflammatory glaucoma in the prodromal stage and in acute inflammatory glaucoma is positive. However, it is not yet clear which operation should be substituted in chronic inflammatory glaucoma.

The majority of patients with glaucoma who undergo operation belong to this group. In the last twenty-four years, in the ophthalmologic clinic of the Imperial University, 70 per cent of the 4,310 patients with glaucoma belonged to this group.

Von Grósz tested two substitute methods, trephining in 570 cases from 1914 to 1923, and cyclodialysis in 540 cases from 1917 to 1927. The immediate results of trephining are better than those of cyclodialysis. Like Damocles' sword, late infection continually threatens trephined eyes. This danger is certainly not a myth as some have thought. Cyclodialysis is less dangerous; the percentage of immediate results is smaller than that of trephining and the lasting results show a still more unfavorable percentage. The immediate favorable result of 68 per cent diminishes successively and after three years is reduced to about 50 per cent. A repetition of the operation, even a combination of cyclodialysis with other operations, and also with trephining, is possible.

The prognosis in operations for glaucoma is unfavorable throughout, since patients with this condition usually seek treatment late.

On the bases of experience with 1,000 substitute operations for chronic inflammatory glaucoma, von Grósz puts cyclodialysis first; in certain cases, trephining is necessary as a second or third operation. This is the plan of operation of the university ophthalmologic clinic:

1. Inflammatory glaucoma in the prodromal stage and acute inflammatory glaucoma: iridectomy.

2. Chronic inflammatory glaucoma: first, cyclodialysis. Repetition in refractory cases. Trephining.

3. Simple glaucoma, if the tension is not normalized by miotics and general treatment: iridosclerectomy, according to the technic of Lagrange.

4. Juvenile glaucoma: anterior sclerotomy. Grósz admits that all the present attempts are merely detail work. Graefe's teaching is still the principal of treatment.

DISCUSSION OF PAPERS BY DRS. BAURMANN, SERR, POOS, LOBECK, PASSOW, THIEL, ASCHER AND SCHMIDT

Dr. vom Hofe, Jena: Hypotonia with an epinephrine effect of long duration cannot be thought of as a sequel of the narcosis and also of the ciliary body which is considered as a gland by von Seidel. The second phase of the epinephrine effect consists of a dilatation of the vessels, which in a gland usually has for a sequel an increase in activity. In the experiments made by Römer and Schmidt, it was shown that in the second stage of epinephrine effect there is an increased amount of fluid in the eyeball, according to the weight. I cannot be far wrong when I say that a change in the covering of the eyeball with respect to its elasticity is caused by the increased bleeding. As for the dark examination, I also tried it on a number of patients with glaucoma. This was of less effect in my cases, and did not show the extent given in Seidel's curves. It is, however, not an absolute proof of the importance of the angle of the chamber, but can well illustrate a vascular effect. For example, it is conceivable that through dilatation of the pupil following an increased tortuosity of the vessels there is an increased resistance in circulation; in areas lying farther back, at times, failure of the regulation mechanism to act results in an increased elimination of fluid through the vascular wall which has been injured by glaucoma.

Dr. Fischer, Leipzig: On grounds like those of Seidel, Serr acknowledged the secretory function of the ciliary epithelium and showed the vital staining of the ciliary epithelium. One knows from the experiments of Wittgenstein and Gädertz that only the acid color materials pass from the blood into the aqueous and the humor, if they are finely divided, but with the base color materials this is not true. All color materials which pass into the aqueous and the humor dye the vessels of the iris and the meningeal vessels, but not the plexus and the ciliary epithelium. All color materials which do not pass into the aqueous and the humor dye only the ciliary epithelium and the plexus epithelium, but not the vessels. This color relation contradicts the secretory function of the plexus and the ciliary epithelium. After the deficiency of the indophenol blue synthesis, Serr acknowledged an excess of oxygen in the ciliary epithelium. In fact, this can be dehydrated to methylene blue (methylthionine chloride, U. S. P.) because of its loosely combined oxygen, even after the intravenous injection of rongalit white. The ciliary epithelium should, therefore, be designated as the storehouse of oxygen. In general, tissues which consume a large amount of oxygen show a constant deficit of oxygen and are indicated by the stains as reduction areas. The ciliary epithelium cannot be considered as a place of special consumption of oxygen simply because it stores oxygen any more than the liver can be considered the most important place of sugar consumption because it stores glycogen. In the anterior section, the lenticular epithelium and the cortex possess peroxidase. The iris has an extraordinary power of reduction, evidently because it must constantly compete for oxygen with the lens, which consumes a great amount of it. Thus can be explained the difference in the need of oxygen in the ciliary epithelium and that in the iris.

DR. SCHEERER, Tübingen: Von Grósz showed the danger of late infection after trephining and said the supposed rarity of such infection is due to the fact that patients go to other physicians. In Tübingen, of 240 patients, most of whom underwent trephining, only one suffered a late infection. This one was not operated on by Professor Stock himself. One must be careful that the subconjunctival tissue is dissected off from the sclera by a few clips of the scissors, so that the conjunctiva is not injured and no fistulation enters. The one patient with late infection had a fistulizing scar.

DR. CORDS, Cologne: I recommended cyclodialysis in 1922 (*American Journal of Ophthalmology*). Experiments of the last few years uphold my point of view. The operation is relatively without danger. A case of late infection, according to Elliot, is to be greatly feared. I believe that cyclodialysis should be the choice for the first operative intervention in simple glaucoma and in chronic inflammatory glaucoma. In some patients, the pressure was normalized from 61 to 25 and remained so for five years.

DR HILDESHEIMER, Berlin: I believe that the arguments of Grósz against trephining are too strong. I can report my experience with twenty patients on whom I performed trephining and who were observed for from ten to twelve years. There was no one case of late infection. What I want to speak about particularly is my observation of a glaucomatous eye on which I performed trephining and which had good filtering blebs. Ten years after the operation, there was a severe contusion, caused by an iron bar. In spite of considerable subconjunctival bleeding of the conjunctiva and ectasia of the cicatricial tissue, infection did not develop. I am of the opinion that the flap should be laid peripherally, so that the often occurring tension of the conjunctival scar will be far outside the trephine cavity.

In remarking on von Passow's report, it is fine that study of the basal metabolism in patients suffering from glaucoma and in normal persons has come to the foreground. In the last year and a half, I have had all patients suffering from glaucoma examined for endocrine disturbances and have obtained results similar to those of von Passow regarding glaucoma. It seems that in glaucoma there is a connection with thyrotoxic changes. One cannot go so far as to say, however, that glaucoma is a thyrotoxicosis, but can only say that thyrotoxic stigmatized patients tend to show increased tension in the eye. In this connection, I would like to mention that the examination of patients suffering from retinitis pigmentosa, showed noteworthy hypophyseal disturbance. In two patients whose visual acuity was greatly decreased, I believe that the use of hypophyseal preparations arrested the decline of visual power. I believe that many diseases of the eye should be studied from the standpoint of internal secretion and that this study will lead to new methods.

In conclusion, I would like to ask Ascher if the instillation of the new anesthetic causes general disturbances also (affects the heart and intestines).

DR. VON IMRE, JR.: In connection with von Serr's report, I would like to say that the epinephrine effect, especially the late effect, should be considered more than a local effect. If not, the effect on the eye not treated with epinephrine would not be so marked. As I reported two years ago, epinephrine acts in the same way when given subcutaneously or intravenously. It seems probable that the effect is conditioned by the other endocrine organs. If I understand Passow, he believes that the hormone treatment should be discarded. I agree with him only thus far, that most of the known preparations are neither durable nor reliable. In many cases, however, suitable extracts are effective. This is true especially in those cases in which glaucoma appears after castration (operation or roentgen

treatment). In these cases, I obtain lasting results with an ovarian extract. In other cases, an increased pilocarpine effect is observed after hormone treatment. I am glad to hear of investigations which agree with mine and which establish a relationship between glaucoma and disturbances of hormonal equilibrium. I would like to ask Ascher if the long duration of lack of sensitivity after the use of the alkaloid cannot cause trophic disturbances.

DR. WESSELY, Würzburg: With regard to late infection after trephining, in a great number of cases of glaucoma, I have observed only one case of late infection. There appear, of course, slight cases of bleb infiltration, but if these are treated immediately, the patient can be cured. But the rare existence of late infection is due not only to the technic of the formation of the conjunctival flap but also to the conditions and circumstances of the patients after they are discharged. I do not use trephining exclusively, but use cyclodialysis also. I have noticed many more recurrences of high tension after cyclodialysis than after trephining. However, I believe too much attention is paid to tension in the eye as a symptom of glaucoma. The most important consideration for the therapeutic measures is the visual power of the eye. There are cases in which the visual power decreases despite regulation of tension, and vice versa.

DR. SCHMELZER, Frankfort: I agree with Fischer that the indophenol blue reactions show the location of oxygen in the tissues dyed blue and places of reduction in the tissues which are not dyed. But I disagree with him when he says that the places of oxygen consumption should be considered as places of increased metabolism. I believe, on the contrary, that the places with great hunger for oxygen should be considered as having increased metabolism. For only in places in which active oxygen is found is there an oxidation of indophenol blue, that is, the tissue is dyed blue. Analogous to this, one sees a deep blue coloration of the retina in the eye, of the gland cells, of the cortex of the kidney, of the muscles, etc., in the rest of the body, while the lens, sclera, cornea and remaining connective and supporting tissue are free from blue coloring.

The indophenol blue reaction also shows a necessary reaction in the surviving tissue; in order to indicate places of particularly marked metabolism, one should also determine a special activity (secretion) in the ciliary epithelium from the positive result of the nadir reaction.

DR. RÖMER, Bonn: The discovery of the rise of intra-ocular pressure in simple glaucoma after the drinking test is important. For this generally recognized method of testing shows that simple glaucoma is an extensive injury of the capillary endothelium of the entire organism even down to the vessels. The same thing is shown in every simple glaucoma in a decreased action of the kidney and in fluctuations of the movement of the plasma. Any study which limits itself to the eye and ignores the entire organism will lead to mistakes. These are the results which I obtained by conservative treatment of hypotonia: In glaucomatous eyes temporary paralysis of the capillaries was brought about with drugs. The lowering of the tonus of the vessels was followed by lowered pressure, but, according to the weighing tests, did not mean a decrease in volume. A truly etiologic treatment of simple glaucoma will come only when one has learned in the manner of Schmidt to study the injury of the entire organism more thoroughly and to treat it therapeutically.

DR. COMBERG, Berlin: In the ophthalmologic clinic of the University of Berlin, late infection is not important. Only about 1 per cent of the patients develop late infection. If one admits that from 20 to 30 per cent of those operated on derive benefit therefrom, this percentage (1 per cent) of late infection is

unimportant. In almost every case, it is possible to check the infection before it reaches the anterior chamber, if the patient consults a physician early enough and parenteral treatment is used.

DR. BAURMANN: Herr Lobeck has shown great caution in his report of an apparatus for measuring changes in volume. The swelling pressure of the normal vitreous is so small (from 0.5 to 1 mm. water pressure) that I believe it is impossible to remove the vitreous from the eye without some fluid subtraction, and without bringing a corresponding amount into the apparatus. In similar experiments which I carried out, I found little increase in volume; I did not, however, weigh an increase in the volume at the exit, because I was sure of the decrease in volume which was mechanically conditioned.

Osmotic effects are always possible, conditioned not by the separating membrane but by the structure of the vitreous itself. Thus, the outer portions of the colloid vitreous act as a membrane against the central portions. Such osmotic effects are seen when the vitreous is put in an anisotonic solution. Then a lessening or increase in volume appears and after several hours disappears. This is not a swelling effect, but is doubtless an osmotic one.

There is not a perfect hydrostatic equilibrium in Lobeck's arrangement of tests, but after adjustment of the equilibrium there follows the disposal in layers with chosen solution from time to time. I am skeptical of Lobeck's observations as to how a swelling can appear not only in an alkali, but also in an acid, medium. In a solution of p_H 5.4, such as Lobeck used, there is a close approach to the iso-electric point, and it is probable that close to the iso-electric region a pronounced outflow developed. Lobeck was far from obtaining a swelling region in a strong acid medium so that it could not have been a case of swelling effect.

LOBECK: In answer to von Baurmann, I would like to say that in my tests it was not a case of osmosis, for this was proved by control tests with Ringer's solution in place of the vitreous, and with Ringer's solution or alkali or acid solution for filling the attached vessel. Here the forward movement of the quicksilver thread occurred in the first ten minutes. In tests of the vitreous, the initial osmosis would be offset in the first ten minutes. Then the following movement of the quicksilver thread, which I observed, could not have been osmosis.

Also the possibility is excluded that with the gain in volume there is a resumption of the water which has passed off with the preparation and reduction of the vitreous, since an increase in water would take place in the control tests with Ringer's solution and vitreous. The control tests show, at the same time, that the filling of the attached vessel with liquid followed by a small hydrostatic difference in pressure does not decide the different outcome of the vitreous test in alkali and acid solution as against the vitreous test with Ringer's solution.

Contrary to Baurmann's test, I could not find an outflowing of the vitreous toward the acid side with change of its actual reaction. I did not approach the iso-electric point as closely as Baurmann believes. The p_H 5.4 was in the liquid of the attached vessel; in the vitreous, however, in the tests with acid solution the p_H was only 6.6-6.9, as was determined at the end of the test.

DR. SERR, Schlusswort: Greater hyperemia of the gland cells can lead to increased secretion only when the proper specific cells are capable of functioning, but not when they are paralyzed by epinephrine. My experiments have to do with the late effect of epinephrine, the effect of the lowering of pressure of a primary vasoconstriction — which appears in considerable amount with the subcutaneous application of epinephrine. The late effect on the pressure of the eye begins at a time when there is severe hyperemia (increase of capillary pressure),

and an increased passage of albumin into the aqueous results. These two factors must be effective in the assumption of a process of filtration in the aqueous. The lowering of pressure in the eye which lasts for several days after intensive treatment with epinephrine in the healthy and glaucomatous eye cannot be explained by a simple vascular effect. On the contrary, Seidel and I can show that the effect of certain poisons (potassium cyanide, cocaine, epinephrine) on the ciliary epithelium causes a reversible hypotonia of long duration. The results of Ascher seem to agree with ours. The lowering of pressure in the eye after the use of an anesthetic agrees with the results after the use of potassium cyanide and cocaine. There is nothing noteworthy in our method of bringing to a standstill the function of the ciliary epithelium. It is a recognized fact that the cyanide compounds of slight concentration and anesthetics limit the processes of oxidation in the cells without permanently injuring them. Herr Schmelzer's work with the indophenol blue reaction has answered that of Herr Fischer. One must rely on the judgment of the majority of authors with regard to the value of this reaction in the proof of intracellular oxidation. The retina is dyed the deepest blue of any in the tissues of the eye, and no one here would consider the retina as anything but a "storehouse of oxygen" (Saverstoffspeicher).

In von Hote's experiments on the pressure reaction of some glaucomatous eyes to the exposure to light and dark, it can be said that one ought to do more than simply generalize. The patients treated belonged to a group who had glaucomatous eyes with flat anterior chambers. My conclusions were made solely from typical cases in which doubt about the mechanism of the light and dark pressure could not exist. Since the increase in size of the pupil to 0.5 mm. dilatation of the pupil leads to a maximum rise in pressure without a further or maximum mydriasis raising the intra-ocular pressure higher, a hindrance of the circulation of the blood in the iris is prevented. The same thing is shown in iridectomized eyes in which the dilatation of the pupil causes no pathologic rise of pressure in the eye.

The mere narrowing of the pupil, and not the effect of light, causes a lowering of the intra-ocular pressure, as is shown by various experiments with such eyes with typical light and dark reactions. Thus a consensual narrowing of the pupil of the opaque glaucomatous eye, caused by exposing the other eye to the light, can cause a prompt lowering of the pressure to normal, while this is not the case when the second eye is blind and a consensual narrowing of the pupil naturally does not develop in the second eye. A narrowing of the pupil caused by paralytic miosis or the subcutaneous injection of morphine can hinder or prevent the increasing rise in pressure.

In consideration of the cases of glaucomatous eyes in which the narrowing of the pupil was the causal factor in the prompt lowering of pressure, one must not ignore the effect of miotics on the glaucomatous eye. The results of Herr Schmidt can be easily explained without the hypothesis of a capillary reaction. It cannot be doubted that in his experiments in which he gave the patient hypotonic fluid by mouth that osmotic factors were concerned. Hertel's experiments have shown us this and have also shown that the intra-ocular pressure can also be lowered by the intravenous injection of hypotonic solutions. It is clear that in the drinking test the increase in the contents of the eye through the passage of fluid must be revealed through intra-ocular pressure, according as it has to do with eyes having free exit passages for aqueous or obstructed exit passages. In the first case, the increase in contents is offset by the outflow of aqueous, and there is no obvious rise in pressure. In the second case, such a compensatory process is not possible, and there is a rise in pressure. Thus is explained the

reason why the drinking test in eyes which are not glaucomatous does not lead to a tonometric determined increase in intra-ocular pressure; and it is also clear why in the drinking test in the uninfluenced glaucomatous eye the rising pressure is checked by miotics. Herr Schmidt's explanation of capillary action is unnecessary.

The observations of Herr Schmidt in which he saw a disturbed course of the drinking test (atypic thinning of the blood and excretion) in internally healthy glaucomatous patients, show that the view that internally healthy patients of every age should show the normal course in the drinking test is wrong. It follows from this that conclusions relative to a general capillary disturbance in patients suffering from glaucoma are not possible without a sufficient number of control tests on corresponding material.

DR. PASSOW: In answer to Imre, I may say that I did not express myself against all hormone preparations, but only against those which increased still more the increased metabolism processes.

DR. THIEL: As to the increased passage of sodium fluorescein into the aqueous of the glaucomatous eye compared to that of the normal eye, I decided that this was a filtration of the color material through the walls of the vessels. Hertel's investigations support my view. By a similar method (investigation in ultraviolet light), I could see a retardation of the passage of color material into the aqueous in cases of glaucoma, when it was treated beforehand with known miotics. The probability of a change in the capillary wall because of the miotics and the possibility of a better circulation of the blood (lifting of the stasis [capillary microscopic observation]) are now supported by Schmidt's report. The drinking test is an addition to the forms thus far known of the tolerance test (coffee, congestion in the head) for testing the function of the glaucomatous eye and the eye in which there is a condition that suggests glaucoma. According to Feigenbaum's examination, a rise in pressure exists in the eye having normal pressure in the dark-light test (Dunkel-Hellversuch). In the glaucomatous eye, it is only caused by a secondary function of the intra-ocular vessels. Feigenbaum's observations of the blind eye show that in the dark-light test it is probably a case of a reflex passing over the vascular nerves.

DR. ASCHER: In answer to Hildesheimer, toxic injuries were not observed; they were not to be expected, since the amounts used were only from 1/100 to 1/500 of that observed to be toxic in the animals experimented on.

In answer to Herr Imre, in experiments with animals, the long hairs of the eyebrow can be tied with those of the upper and lower lid in a rabbit, in order to prevent erosion of the insensible cornea. In experiments with human beings, a bandage must be used.

In answer to the closing words of Serr, I am acquainted with Seidel's and Serr's tests. Because calcium cyanide seemed too dangerous, I made injection tests with an organic derivative of cyanide and acetonitril, and attained lowering of pressure with it, although not of as long duration as with the alkaloid. Even 20 per cent cocaine lowers the pressure only for a short time.

In answer to Herr Baurmann, seven years ago when I again took up Jaeger's work on the mineral content of aqueous in man, I expressed the opinion that the lowering of the crystalloid content in the blood as well as the increase of the same in the aqueous could lead to rise in pressure. Contrary opinions were expressed that such differences were practically insignificant since they must be immediately offset by diffusion, before they could reveal an osmotic effect. Therefore, I am greatly interested in Herr Baurmann's results, especially the fact that there is a

temporary decrease in the calcium concentration. This may serve as an example of the possible remarkable differences in osmotic concentration between the blood and the aqueous which may appear for a certain time at least. They may be immediately offset, but this can take place only through the flowing of water into the eyeball, which leads to dilatation of the wall of the eyeball, closing of the vortex veins and passive hyperemia; in other words, there can be a double change in the concentration of the blood, despite the possibility of its being offset, and this can be considered as the existing factor in a case of glaucoma.

In answer to Herr Gross, the loop suture has proved valuable in cataract operation, but in cyclodialysis I do not consider it as good as the fixation forceps of Elschnig. With them, the sclera can be grasped so firmly that it forms a small shallow fold which permits a harmless opening of the sclera in a small region without injury to the choroid or the vitreous, and then the eyeball can be fixed more closely at the entrance of the spatula which is naturally excluded in the case of a loop suture of the rectus.

DR. SCHMIDT: In reply to Serr, numerous control drinking tests were made with people of every age. The course of the drinking test is entirely typical and completely independent of the age of those treated. Changes in pressure of the eye do not appear in people with normal eyes in the drinking test, regardless of the age of the patient. It is further shown that it is not the increase of plasma, as such, which causes an increase in pressure in the glaucomatous eye. Schmidt has tried many possibilities of increase in plasma (intravenous injections of distilled water, light baths, cold baths and drinks of physiologic sodium chloride solution in glaucomatous patients), and he has never found that this increase in plasma has led to an increase in pressure. Increase comes only under the conditions of the drinking test.

THE ANATOMIC FOUNDATION OF PUPILLARY DISTURBANCES, ESPECIALLY OF THE LOSS OF PUPIL REFLEXES. DR. LENZ, Breslau.

For his experiments with the pupillary reflex tract, the speaker used the proved method of coloration of the fibrils in a pathologic series. In the small cell portion in front of the macronucleus and the forwardly situated polar nucleus and in Edinger's nucleus whose direct backward continuance forms a portion of the head, a tip of the lateral macronucleus penetrates. The cells of this "frontal tip" are somewhat larger and more angular than those of the polar nucleus, but smaller than those in the greater part of the lateral macronucleus. The frontal tip sends out typical oculomotor fibers in this region. The fibers of the rectus muscle originating in the small cell region and from cells in the central gray matter do not reach the protruding oculomotor bundle (contrary to Bernheimer's view). This anatomic condition shows that not the small cell region, but the frontal tip is to be considered as nucleus for the sphincter pupillae. The inner covering of the afferent pupillary fibers, with tissue about the frontal tip and the small cell region, shows that the latter has an important function in the light reaction, for instance as a switching or distributing mechanism.

The results in five cases investigated agree with this. All showed increased or inert light reaction with normal or injured convergence reaction. In one case, there was inert light reaction and almost normal convergence reaction on the right side and ophthalmoplegia interna on the left. One was a case of syphilis, and another was tabes.

The cause of the anatomic aspect of the disease is always a severe vascular disease. The raised or inert light reaction with a normal convergence reaction is

conditioned by a lesion of the small cell region and of the afferent pupillary fibers which cannot be separated from it so that the sphincter nucleus, which is itself intact, is, to a certain degree, blocked in the frontal tip.

If the convergence reaction is also disturbed, the lesion extends more or less to the sphincter nucleus.

In ophthalmoplegia interna, the small cell region is relatively little injured; on the other hand, an extensive, gliose scar occluding the sphincter region itself was found with the spreading of the vascular injury toward the central nuclei lying in the middle line.

Spirochetes could not be shown on account of the methods used in treating the sections. The vascular changes were characteristic of syphilis. They were related to a destruction of specific tissue of the surrounding space and thus of the afferent pupillary fibers also.

DIAGNOSIS OF CHOROIDAL MELANOSARCOMA. DR. HENNING RÖNNE, Copenhagen.

Some diagnostic problems were discussed with regard to some illustrative cases.

1. Lancaster's method, illumination of the sclera after conjunctival incision, which, in its original form, is to be severely criticized because of the possibility of a retrobulbar hemorrhage developing, was used in this way: After the instillation of atropine, an ophthalmoscopic examination was made by the illumination light; this was simple in the operation room, because of the brightness of the illumination light. It was then possible to see the contour of an eventual tumor through the detached retina.

2. The special kind of subretinal fluid was described as the cause of the characteristic yellowish color which can be seen through the detached retina, because the yellow color was marked in a case of thin surface sarcoma of the choroid in which illumination gave an entirely negative result.

3. Fields of vision and microscopic preparations were shown of those patients in whom the melanosarcoma had broken through the retina and grown into the vitreous. Patients always go to the physician when they begin to suffer from hemorrhages of the vitreous as initial symptoms. The pathologic-anatomic character of this tumor seems to be a cavernous melanosarcoma.

DISCUSSION

DR. SCHEERER, Tübingen: Although the author did not mention diagnostic puncture of the sarcoma of the choroid, it seems to me that this would be permissible before intervention. In an eye in which there was sarcoma of the choroid, and in which puncture had been performed on the other side, on the place corresponding to the puncture a canal through the sclera was found which was filled with red blood corpuscles and a proliferation of young tumor cells. Immediately under the place of puncture in the tumor, a blood space was found, out of which the blood had been discharged into the conjunctiva. The tumor cells, which could be recognized by their form and by several pigment cells, had already spread to the conjunctiva, although the eye had been enucleated five days after the puncture.

The quick spread, also, perhaps, the puncture of blood spaces, makes diagnostic puncture in sarcoma of the choroid seem extraordinarily dangerous; it is also superfluous, since a sarcoma situated far forward can be determined through diascleral illumination. In sarcoma situated farther back, puncture is prohibited, and if one relies on a negative result, mistakes and loss of time in treatment may result.

DR. LAUBER, Wien: The diagnostic difficulties in suspected intra-ocular tumor are illustrated in a case which I studied. An old woman suffered a large detachment of the retina which I suspected. Illumination with the Hertzell lamp revealed a shadow. Since the patient still had a visual acuity of 0.4 she could not decide on operation. I sent her to Herr Dimmer who also could not decide on the diagnosis of a sarcoma. Illumination with the Hertzell lamp did not show it. Then the glass rod of the Sachs lamp was inserted under Tenon's capsule and illuminated from the rear the spot lying over the macula, whereupon all four physicians could see a dense shadow. Enucleation was performed.

DR. LÖHLEIN, Jena: The speaker pointed out that cases of retinal detachment because of tumor can be recognized by a yellowish coloration of the retina, and that here, perhaps, is a differential diagnostic factor in doubtful cases. I would like to ask if it has been shown that in such cases the yellow coloration is traceable to the color material of the blood. If this is so, it indicates the possibility of a tumor, but it is not known with absolute certainty, since detachments occur because of hemorrhages alone, without the presence of a tumor.

DR. ERGGELET, Jena: Since 1912, I have been using the true skin illumination in cases in which there is a suspicion of a tumor as cause of a serous detachment of the retina. In this examination, the use of alternating illumination is valuable (Wechselbeleuchtung). If the spot of light of the true skin lamp attachment lies at the posterior pole, one can observe in the upright image the illuminated inner portion of the eye with the help of the (Rekossisch) disk, first taking care of the necessary installation with a lighted electric ophthalmoscope. If a helper puts the stream of the true skin lamp out of circuit at the same time as he puts in that of the ophthalmoscope, a valuable comparison of both illuminations results. C. Zeiss adds a glass cone of the proper curve to L ıge's lamp.

With regard to the strength of the illumination, many desire lamps of still greater strength. On the contrary, I found it necessary to diminish the light and could easily work with a switch of second resistance.

HISTIOCYTES IN FATTY DEGENERATION OF THE EYEBALL. DR. P. A. JAENSCH, Breslau.

Lipophages are known as derivatives of histiocytes. The eyes of forty animals were dyed with tryan blue and were examined with respect to the following: When do these cells take up fat, what transformations do they go through and what are the sources of fat? The eyeballs were examined from eighteen hours to eighteen days after injection with bacterial deposits or 10 per cent solution of sodium chloride. In the earliest stages, there were no histiocytes in the vitreous; they appeared after the formation of an abscess, in the marginal portion of it. They arose from the ciliary processes and the tissue of the papilla, and after destruction of the lamina vitrae out of the choroid as well. They lost in color intensity as soon as they left the place of their physiologic origin and came in contact with the exudate; the appearance of sudanophil portions in the histiocytes was simultaneous with this loss of color. They were never found in the middle, but always along the edges of the abscess. The transformation of the intra-ocular exudate was designated fatty degeneration. The lens and the retina were sources of fat; only the latter was important in some degree—the exudate itself, and the bacteria, whose production of fat cannot be proved from the section and the fat set free on destruction of the cell and nucleus. The blood is not important in this process. The histiocytes take up ready fat or its components (Bausteine). This is a case of fatty degeneration in Aschoff's sense.

DISCUSSION

DR. ENGLEKING, Freiburg: I agree with Jaensch that the fatty degeneration of the eyeball is a case of infiltrative fatty degeneration according to Aschoff.

Jaensch's observations should not be used with reference to the genesis of xanthomatosis bulbi (von Szily) in man without further investigation. In all cases of this disease, I found an increase of the cholesterol content of the blood. The fats stored by the histiocytes probably come finally from the blood. How this takes place is not explained in Jaensch's experiments. Perhaps the normal amount of cholesterol in the blood would be enough to be considered as "sufficient beginning" of cholesterol through the blood, especially since we are not dealing with a case of normal vitreous according to Jess. I do not disagree with the view that to a certain extent the stored fats can come from the cells destroyed in the territory of the disease, but I believe that the blood is to be considered as an essential purveyor of lipoids.

DR. JAENSCH: If the cholesterol content of the blood, which is small in rabbits, were of greater importance, then cells containing fat would be expected in the immediate vicinity of the vessels, especially in the ciliary processes. This is not true. Histiocytes takes up much more fat when they come into contact with the exudate, at a time when there are no severe abnormal changes in the ciliary body.

INVESTIGATION OF KERATITIS BY MEANS OF BUILDING THE TISSUE. DR. SCHMELZER, Erlangen.

According to Recklinghausen, Cohnheim and Leber, the increase in cells in the inflamed cornea is caused by the immigration of white blood corpuscles into the inflamed tissue; according to Grawitz it is not an immigration of cells, but a melting of the so-called "slumber cells" (Schlummerzellen) out of the living intercellular substance on the inflamed spot.

In order to reach a decision, Löhlein studied the result of artificially placed infection in the cornea of aleukocytic rabbits. He found that in aleukocytic animals no increase in cells occurs in the cornea, nor in the subcutaneously implanted cornea of a pig, which is contrary to the effect in normal healthy rabbits. Thus, he determined that the Cohnheim theory of immigration of cells in keratitis was correct.

P. Busse contradicted Löhlein, since his tests did not show that the injection of mesothorium-X did not injure the proliferation power of other types of cells besides those of the white blood corpuscles—also the cells of the cornea. Löhlein did not furnish any proof that the function of the cornea of a pig implanted in the rabbits was effectively destroyed. The building up of the cornea can give clear results only in the plasma culture, since from the beginning no leukocytes are present here.

In his own experiments the speaker can show that the cornea of dying aleukocytic rabbits grows just as well in the test tube as that of healthy mature rabbits (demonstration of photograms of cultures of the corneas of normal and aleukocytic rabbits). It can be further shown that the cornea of a rabbit placed in 10 per cent formol for from five to seven days does not show any phenomena of growth in the laboratory, but subcutaneous implantation in a healthy rabbit shows clear infiltration with polymorphonuclear cells (demonstration of corresponding preparations).

These investigations complete and support Löhlein's conclusion that the increase of cells in keratitis is especially of hematogenous origin.

DISCUSSION

DR. ASCHER, Prag: Would it not be interesting to implant by means of keratoplastic operations the disk of a normal cornea in the eye of an infected animal, and then the disk treated with formol in a normal or infected eye?

DR. LÖHLEIN, Jena: My experiments dealing with the histology of keratitis have found complete support in those of Herr Schmelzer. At the time I made my experiments, I was attacked by Herr Busse-Grawitz, and in answering him made some plasma culture tests with the living cornea and with the cornea treated with formol. I found that in the tissue culture of the cornea treated with formol there was neither a cell formation nor a cell degeneration, that contrary to Grawitz's doctrine the corneal tissue was nonviable. It can be seen that such polymorphism of the developing cells is to be expected, and that it is difficult to make a clear distinction between the types of cells found.

REPRESENTATION OF THE DISEASED CORNEA IN THE REFLEX IMAGE. DR. E. P. FISCHER, Leipzig.

Several years ago, I made some experiments with the representation of the corneal surface in the reflex image. I demonstrated that in the furrow appearance (furchenbilde) which develops after movement of the lids, changes in the epithelium or marks are manifest and that these marks remain in evidence long after clinical healing in such diseases as superficial herpes and dendritic keratitis. Now this determination can be extended, for it would seem that the marks remaining in the furrow image are so characteristic of the causal processes, that this process may be diagnosed from them.

After superficial injuries from foreign bodies which heal without leaving clinically apparent marks, characteristic marks develop in the furrow image. At the right, under the regular course of the furrow picture, there was a circle of light reflexes the shape of hawthorn leaves. The roset formation was shown in the next picture in the limbus which was clearly marked by parallel light reflexes. In the third picture were seen three little rosets and a dislocation such as remains after linear erosions.

Roset-shaped marks appear in the furrow picture in secondary deep keratitis. They are complicated by caustic-like light reflexes. The surface of the cornea is clinically intact; the reflex formation shows that it is sunken into a key-shaped form.

Interstitial keratitis shows characteristic groove pictures. Either the picture is completely formed or large kidney-shaped areas remain.

In spite of the fact that there are no clinical observations on the corneal surface, one always sees in phthisis bulbi, a characteristic groove picture which differs from a normal one.

Changes and scars which can be seen with the slit lamp, but which cannot be etiologically differentiated, can be identified by reflex photography.

When the mirrored image of the cornea is stippled, there is no groove image. Stippling varies with various diseases.

Dr. Fischer's pictures showed the reflex image of stippling in acute glaucoma. There were no isolated ring light reflexes, but vesicles. The next picture showed a coarse stippling. The vesicles were larger, narrow and polymorphic. If the eye remains open and the lid does not move, a net formation develops. The next was a picture of the same eye taken three hours later after decrease in tension from 68 to 32 mm. of mercury, Wendt. The marks of stippling were present, and at

the right were large vesicles which were not clinically apparent. The formation of vesicles may have resulted from the reduction of pressure.

Stippling in interstitial keratitis manifests itself differently in the reflex image than does stippling in glaucoma. The ring-like reflexes are confluent and are much thicker than those in glaucoma. The picture changes much more quickly than in glaucoma when the eye is held open.

No furrow image of the cornea is attacked by trachoma. The cornea shown revealed no pannus, although the entire surface was uneven. Here was a pannus with its limits clearly marked. The surface was granulated.

Between the two groups of diseases, in which the changes of one are visible only in the groove image and in the other are missing, there is a third group which has a group picture, but the changes are characteristically manifest before the lids move.

In this third group belong erosion scars, of which I can show a carbide erosion. The web reflexes above and below the middle darkening zone have nothing to do with the groove picture; they are only effects of the lids, just like the related reflex groups in dystrophy, which also belong to the third group. Characteristic changes are shown without movement of the lids.

To the third group belong further stippling in iridocyclitis and the scars left by keratitis eczematosa. These form an apparent exception to the rule of the characteristic reflex image for each process for they show reflexes of many forms. In spite of the multiform character of these reflexes, they belong to similar surfaces, namely, to slightly concave depression. The next picture showed eczematous scars; this was a relatively simple reflex formation. The next picture was more complicated. It was probably a saddle surface (sattelfläche) that showed such a reflex. The next picture showed several overlapping surfaces of changing curvature. The macula was not clinically interesting.

The changes shown in the contusions of the eyeball are of great interest. There is a stripe formation which begins from a central point. This stripe evidently originates through the elastic curvature of the cornea which was clinically healthy.

It is easy to determine the place of perforation. All places of perforation pulsate synchromatically with the radial pulse. Usually in pictures of the places of perforation one sees only the zone which is illuminated and an accompanying reflex. Both pulsate, the zone of illumination lights up with each pulse beat, and the accompanying reflex changes its curvature. The place of perforation is also systolically indented.

The number of characteristics and typical reflex images will be increased since probably there must be specific reflex images for other diseases.

DISCUSSION

DR. ASCHER: It may be that the peculiar stripe formation after contusion is due to folds in the cornea which are later smoothed out, but which leave small injuries in the epithelium.

DR. FISCHER: I appreciate Comberg's suggestion and will endeavor to experiment with a large enough number of Staehli's lines. It is rather difficult to procure uncomplicated cases of the same type in sufficient numbers. It seems correct to say that the stripe formation after contusion of the eyeball occurs because of folds in the cornea. It may also be that changes in the water content and partial swelling of the epithelium may cause such reflex formations.

Scientific Meeting, Aug. 8, 1928

DR. SCHEFFELS, *Chairman*

INJURIES TO THE LENS IN WORK IN THE GLASS INDUSTRY. DR. E. STOEWER, Breslau.

The speaker studied 700 workers in the upper Silesian industrial region from steel and iron factories as well as those from a factory which manufactured chromic colors and those from a carbide factory. The examination was made with reference to occupational injuries to the lens. Besides tests of the visual acuity, and opthalmoscopic examinations, still others were made with the slit lamp. Of 270 workers, one was found with a minute opacity in the pole of the left eye similar to the incipient cataract of a glass blower. He was 56 years of age and had been in this work for thirty-five years. Of 100 iron workers, one had a posterior cataract in each eye. The man was over 60 years old, and had worked before the fire for thirty-three years. Examination of 250 blacksmiths revealed three cases of opacities at the posterior pole (two unilateral and one bilateral) which were not typical cataracts developed from working near fire, but the situation and appearance were suggestive of cataract. Among the workers in the factories where chromic colors and carbides were made, no injuries of the lens were found. No case of detachment of the anterior capsular lamella (zonular lamella) was observed. From these observations it is evident that glass blower's cataract is not prevalent among the men in these industries who are not glass-blowers.

DISCUSSION

DR. COMBERG, Berlin: I should like to call attention to Roggenbach's measurements (*Ztschr. f. Augenh.*, 1927).

DR. ERGGELET, Jena: With regard to the small number of injuries to the lens which occur in those who work near fire, it should be remembered that according to English journals the kettle-makers are frequently and severely attacked.

In the question touched by Herr Comberg about the mode of action of the injurious rays, Terson's opinion seems possible, that there is not a direct but an indirect effect on the lens, if one observes the similarity of this injury to the lens to that caused by roentgen rays.

A DEVICE TO BE USED IN PTOSIS. DR. SCHNEIDER, Munich.

Two experiments were made in a case of bilateral ptosis for the purpose of raising the hanging upper lid with the help of a pair of ptosis glasses. One is in the form of a horizontal ledge of skin which gives a more firm hold to the frame of the glasses. In the other better method, a kind of loop was formed from a strip of skin on the upper lid. The frame of the glasses was fastened on this from underneath. The last type can be turned on a horizontal axis and is pressed upward by a spring which dynamically replaces the levator of the lid and thus permits the contraction of the sphincter of the lid.

COVERING FOLD FORMATION IN OPERATION FOR PTOSIS. DR. VON BLASKOVICS, Budapest.

In his levator and tarsus resection, von Blaskovics attains a complete effect against ptosis. The levator can be made accessible, extending from the posterior surface of the lid; the addition of the narrowing of the tarsus makes possible a continual increase of the distance in the space between the lids. The artificial

extension in the muscle in conjunction with the sphincter causes a good substitute for movements of the lids. The speaker named only one disadvantage—that through the pull on the levator the covering fold is moved forward against the edge of the lid. This cosmetic disadvantage can be removed by means of three twisted seams, the height of the cover, which are made after shortening of the muscle and narrowing of the tarsus. Thus, the covering fold is put in the right place.

PATHOGENESIS AND OPERATIVE TREATMENT OF THE CORNEA. DR. F. SCHIECK, Würzburg.

The presence of the arcus senilis is not limited to patients in later life, but, according to the new results obtained in examinations of lipoid deposits with the microscope and the slit lamp, evidences of this disease come early. They develop from two zones, one of which is in the region of the membrane of Descemet, and the other in the region of Bowman's membrane. Further development may as well lead to arcus senilis as to two other changes which develop on the same basis. In one case of the last mentioned type, Schieck excised the whole area affected after a double pedicle conjunctival flap was formed, which was used as a bridge over the gaping wound. The result was a firm scar capable of resistance. Microscopic examination of the portion which was removed showed that injury to the cornea proceeded from the rear, for Descemet's membrane was swollen and defective in a large portion so that the aqueous and iris pigment had flowed into the cornea. There was a certain similarity to the conditions present in keratoconus. The single case of groove formation studied (E. Fuchs) showed atrophy of Bowman's membrane and the anterior corneal layers, while Descemet's membrane and the posterior lamellae remained uninjured. Related to the development of lipoid infiltration of the corneal periphery from Bowman's and Descemet's membranes is the development of the furrow as well as the ectasia, according as the anterior or posterior boundary membrane is destroyed.

OPERATIVE COMMUNICATIONS. DR. SUSSICH-MATKOVICH, Zagreb.

DISCUSSION

DR. STOCK, Tübingen: I do not exactly understand Herr Schieck when he says that in peripheric ectasia of the cornea Descemet's membrane is the first to be injured. On the contrary, it can be plainly seen in the slit lamp that Descemet's membrane is the last to be affected. I do not, therefore, agree with Herr Schieck. In his case, it may be that the membrane was torn by secondary injury.

DR. KRÜCKMANN, Berlin: I often use the Besredka reaction as a serodiagnosis to determine whether tuberculous or syphilitic infections or lymphatic ophthalmia is present in the eye. The contents of the anterior chamber are sufficient for this.

DR. SCHIECK, Würzburg: Descemet's membrane is also visible in the slit lamp in cases of keratoconus, but it is not normal.

INVESTIGATION OF HERPES: I. THE BIOLOGY OF THE VIRUS. RELATION OF HERPES TO ZOSTER. DR. W. GRÜTER, Marburg.

Three kinds of bacteria of slight neuratrophy and higher dermatrophy were studied. Clinically there was found in the eye and in the region about it the formation of a disease similar to one caused by a vaccine. The disease was in the form of large white vesicles and crater-shaped ulcers, with a large red area of

inflammation. Then, uncharacteristic deep-seated white ulcers developed on the cornea; later, branchings developed similar to those in dendritic keratitis.

Types of high neuratrophy and relatively low dermatrophy were studied. There was 100 per cent of spontaneous encephalitis after inoculation of the cornea. The first inoculation of the cornea did not take, but those of the brain which were performed at the same time did. Later, these types showed no unusual deviation from the normal reaction. Clinically, in two cases, keratitis diskiformis was the cause; and in the third, a typical ophthalmic zoster.

The case of zoster occurred in a young man, aged 26, who had contracted malaria in 1916 during the war. There was no sign of syphilis. More exact analysis showed that this germ could be completely controlled in patients who inherited it, as well as in others, by means of skin inoculations. On ocular inoculations of an eye blinded by glaucoma, a typical case of dendritic keratitis developed. The patient who inherited the disease was in no way nonsusceptible to inoculation with the usual herpes simplex material. There was marked formation of vesicles in the region of the zoster scar, as well as in other parts of the skin which were not diseased. A typical zoster caused by the herpes virus leaves no immunity. The fact could be determined in the ocular phenomena still better than in the skin. The ocular recurrence in typical zoster contradicts the exclusive etiology of chickenpox. Grüter studied seven typical cases of zoster. Up to the upper positive transmission test, all others showed a doubtful or entirely negative result. Grüter believes that not one etiologic factor but several are the cause of typical zoster. Now the virus of chickenpox and that of herpes are known as causal factors.

KERATITIS IN CONNECTION WITH HERPES. DR. SALZMANN, Graz.

During sixteen years, the speaker collected fifty cases which form a passage of keratitis punctata superficialis to keratitis disciformis, sometimes one or sometimes the other stands in the foreground. These cases differ from keratitis punctata superficialis by the small number of foci, by the larger foci, here and there by a tendency to merge together or by the appearance of fine opacities which comprise groups of foci. There can also be ulceration in part of the foci, although this process takes place slowly. The smaller the number of foci, and the larger the single foci, the more does the disease resemble keratitis disciformis which, as a single centrally situated focus, forms the conclusion of the whole series.

Finally, fine opacities and facets remain. The course of the disease is long drawn out. The prognosis is favorable. At most, there is only a slight injury to the sight which is due to the formation of facets.

Dr. Salzmann does not claim to have found a new form of keratitis, but believes that local and temporal differences occur in cases of keratitis which are related to herpes—local, because he does not remember seeing similar cases before, and temporal as is shown in the case of keratitis punctata superficialis, the frequency of which was so great in 1889 that it was described as a new form. During his sixteen years of activity in Graz, the speaker did not observe a typical case of keratitis punctata superficialis. He believes, therefore, that keratitis punctata superficialis and keratitis disciformis are not to be separated from the clinical standpoint, since the typical cases differ so much, one from the other.

DISCUSSION

DR. KUFFLER, Berlin: I also have observed the occasional great frequency of cases of superficial keratitis. This frequency often gives the impression of an epidemic.

DR. SALZMANN: Keratitis punctata superficialis appeared during the great epidemic of influenza in 1889, and in influenza especially local and temporal distinctions appeared.

DR. MARCHESANI, Munich: These tests made in rabbits proceed from the clinical experience that in man only inflammatory conditions of longer duration following perforating injuries to the eye eventually lead to sympathetic opththalmia. *Bacillus subtilis,* which is generally not pathogenic for animals, was injected into the eye, and the injections were repeated as soon as the inflammatory condition became apparent. The presence of choroiditis was observed in part of the cases after three injections in the second unaffected eye. Histologic examination of the infected eye revealed the formation of membranes in the vitreous, and inflammatory infiltrations of chronic character with star-shaped typical tuberculoid structure in the uvea. In the other eye, there were numerous localized collections of round cells, and a few epithelioid cells in the choroid. The retina was completely unchanged. Only the portion of the optic nerve belonging to the infected eye was inflamed; the optic nerve of the other eye was normal. Bacteriologic examination of the other eye showed that no bacteria could be cultivated. Control inoculations with varying arrangements of tests were negative. The pathogenesis of this experimental sympathetic choroiditis was explained by the development of an allergy against the repeated inoculation of the bacteria. The organically related oversensitivity which appeared in the uvea of the second eye was explained by the organically specific character of the albumin in the uvea, through which the sensitization in the first eye emanated.

From animal experiments it can be seen that sympathetic ophthalmia in man is an (anaphylactic) allergic disease. The cause is not a preexisting tendency for the disease, but the presence of a bacterium in the injured eye.

EXUDATIVE SEROUS SYMPATHETIC CHOROIDITIS WITH DETACHMENT OF THE RETINA AND COMPLETE CURE. DR. PASCHEFF, Sofia.

1. Sympathetic ophthalmia is a primitive inflammation of the uvea and not of the visual apparatus, such as the optic nerve and the sheath of the pia mater. 2. Not only can the inflammation of the uvea be proliferative or exudative, but, in the same person, the diseased eye may be proliferative and the sympathetized eye exudative. The exudative inflammation may be serous or plastic. The serous inflammation may appear as serous iridocyclitis or as serous choroiditis with retinal detachment. 3. Sympathetic ophthalmia in gross analogy is related to tuberculosis in structure, evolution and symmetrical development, and should be further studied in this light.

DISCUSSION

DR. DEUTSCHMANN: The optic nerve preparations show inflammatory changes in the first optic nerve, in the chiasma and then out into the tractus of the other side. The second optic nerve is free from inflammatory changes, so that the theory of migration is challenged. The greatest difficulty is the proof that bacteria or toxins go from the first optic nerve up to the chiasma and brain against the lymph stream. The speaker does not argue this point. In his earlier communications, he has shown that the infection must travel from the brain to the eye not only in the optic nerve and its sheaths, but that it can also be found outside of the eye in the orbit.

DR. MARCHESANI: I wish to make a more exact description of my observations of the optic nerve. In the region of the inoculated eye, there is a localized and diffuse inflammation. This is comparable to the inflammation in the eye;

there are present in it all intra-ocular inflammations. The increase of cells in the chiasma is not an inflammation, but a degeneration phenomenon; there is an increase in glial cells, scavenger cells for the removal of medulla sheaths.

The difficulty in the migration does not consist in the fact that the bacteria press into the chiasma—all pathogenic bacteria can do so in experimentation. But the difficulty lies in the explanation of why the bacteria, once they have reached the chiasma, always go toward the second optic nerve and never to the brain, a way which is open to them.

A Plastic Anatomic Study of Dürer's Eyes. Dr. Reitsch, Hirschberg.

Plastic anatomic studies of the eye are thus far unknown to the history of art. The only exact method of investigation, which is called Morrell's method, is related to similar observations of the hands, finger nails, ears and nose. A series of pictures were shown which cannot be overestimated in value; a self portrait of 1498 and the "blessed healing" of Jacobo de Barbari (Dresden) show that before 1500 there were artistic relations between Dürer and Barbari, and the origin of Barbari's picture must be dated back to 1498 and not to 1503. In the presentation of the corneal image, the influence of the art of the Netherlands can be seen. From Dürer's characteristic picture of sleeping eyes and from the eyes of the Madonna, especially from the formation of the inner angle of the lid, interesting conclusions are possible. It is further shown that the presentation of the eyes in "Christ with the Crown of Thorns" and the picture of "Meister Wolgemut" contradicts the authorship of Dürer.

The Passage of Immunospecific Material Into the Intra-Ocular Fluids and Its Pharmacologic Influence. Dr. A. Franceschetti, Basel.

Since investigation has shown that through the administration of diuretics the limit of the blood and ocular fluid can be broken through, the influence of theophylline on the passage of immunospecific materials in the ocular fluids was studied.

Rabbits immunized against active coli showed the presence of agglutinin. After puncture of the first eye, the animals were intramuscularly treated with 0.12 Gm. of theophylline sodio-acetate per kilogram of body weight. Two hours later, the anterior chamber of the other eye was punctured. The result was that on the average the serum aqueous quotion (relation of the agglutination titer in the blood serum to the titer of the aqueous) was five times greater after the use of theophylline.

In passively immunized animals, agglutinin could be found in the normal aqueous an hour after the intravenous injection of a coli-immunization serum. In animals which had been treated with theophylline at the same time, the serum-aqueous quotient was higher on the average. Two hours after injection, the passage seemed to be most increased (four and one half times).

Hemolytic amboceptors appeared in greater numbers in the aqueous after theophylline injection, and the serum-aqueous-quotient was three times greater than that in the control eye. Precipitations which were hardly found in the normal aqueous, appeared after injection of theophylline, especially when the doubled amount of antibodies (aqueous) was used in evaluation according to Uhlenhut.

The vitreous was examined at the same time as the aqueous as far as was technically possible. An increased passage of agglutinins could be seen after the injection of theophylline. Hemolytic amboceptors and precipitates were present also.

Since the immunization bodies were combined in the entire globular fraction, it was indirectly proved that the increase in albumin brought about by diuretics in the vitreous and aqueous had a relation to the globulins.

On the basis of the increased passage of immunization bodies caused by theophylline, it has been seen that diuretics have a therapeutic effect on the eye. Experiments thus far have proved favorable to the use of theophylline in infectious diseases of the eye. Thus, the breaking of the limits of the blood and fluid of the eye through diuretics is a new method of treatment of diseases of the eye.

INJURIOUS EFFECTS OF THE REMOVAL OF THE LACRIMAL GLANDS. DR. P AVIZONIS, Kaunas.

The speaker observed seven instances of the injurious results of removal of the lacrimal glands. In two cases, after extirpation of the palpebral lacrimal glands, a serious conjunctival catarrh appeared in the eye which was operated on, and despite years of treatment showed no improvement, and disturbed the patient much more than the dripping tears before the operation. In a case of smoothly healed trachoma, the dry catarrh was markedly developed and grew worse until after four years there was a formation of partial xerosis of the conjunctiva of the eyeball. The viscous conjunctival secretion was fastened together in pieces at the opening and closing of the lids, and these pieces were moved back and forth on the corneal surface and were difficult to remove from the cornea. They were wiped off in long thin threads. After crying, the eye remained dry, only became more red. Trachoma was not present. In another case, the entire surface of the conjunctiva of the lid had a dull xerotic appearance, and in two cases total xerophthalmus developed immediately after operation. In the last three cases, trachoma was present in both eyes, and in two cases was healed by combined excision of the folds of transition. The speaker showed by these observations that there is danger in the removal of the palpebral lacrimal glands, and that in cases of trachoma, removal is contraindicated. Indications for removal should be limited, and conservative dacryocystorhinostomy should be preferred.

DISCUSSION

DR. MÜGGE: In a large number of extirpations of the lacrimal sac in which I removed the lacrimal glands by Axenfeld's method, I did not observe any of the conjunctival diseases described by Avizonis. However, his observations show that new methods should be employed in place of the extirpation of the lacrimal sac, and Toti's operation, or one of its modifications, should be used. Then the removal of the gland is no longer necessary. When the immediate removal of suppuration of the lacrimal sac is necessary, the Toti operation is equally useful.

DR. SCHEERER, Tübingen: I have observed four cases, each of which showed a noteworthy peculiarity. In the first case, there was an average disturbance of the secretion (according to Schirmer, 5 and 8 mm.), but there was no fascicular keratitis, so that the latter did not coordinate with the former, but was dependent on it in degree. The second case was that of a woman in whom the disturbance of secretion and fascicular keratitis appeared during pregnancy, but disappeared at the end of the puerperium without leaving a trace; this case is a significant indication of the relationship to the ovarian function. The third case was one of atrophy of the mucous membrane of the tongue and mouth. There was no simultaneous arthritis. If the latter were present it would represent a coordinated complication as, in our third case, atrophy of the mucous membrane of the mouth.

According to Isakowitz' report, it would not be a case of gout but one of Umber's periarthritis destruens. According to a case of Engleking's, the secretion of the lacrimal glands ought not to be injured; the changes ought to comprise the entire subconjunctival tissue. Perhaps there is a special analogy between disease of the conjunctiva and diseases of the joints; synovia, the fluid of the joints, is the product of the tissue change in Umber's disease.

A Therapeutic Use of the Thorium X in the Eye. Dr. Löhlein, Jena.

Löhlein showed that in spite of the favorable effects which are obtained by the use of radium and mesothorium in a series of diseases of the eye and its adnexae, hindrances present themselves to the extensive use of radioactive substances: the high price, the inconvenient method of application and difficulty of dosage owing to the dangers from injurious accompanying phenomena. Löhlein thinks that probably thorium X points a way out, since it is put up in solution and in salve form, and can be furnished in optional doses (activity curve of alpha radiation). Thus, there is a possibility of trying a radioactive means of known activity with determined, constant methods of use suitable for the eye. Löhlein reported his work in this direction.

1. The consistency: Tests in rabbits showed that an ointment of thorium X, which contains 1,000 Gm. of electrostatic units, caused no irritation or injury when used for twenty-eight days, once a day. Even when the salve was used five times a day, only one animal showed a reaction: seven hairs fell out of the lids, and there was depigmentation of the third lid and opacity of the cornea. Similar injuries appeared after nine days in a case in which salve five times as strong was used five times a day. In a blinded human eye, a salve of 1,000 electrostatic units per gram was used for several days, as in dermatology, without irritation or injury.

2. Bactericidal effect: This was tested in a whole series of germs pathogenic to the eye. The result was that the addition of a sterile watery solution of thorium X to serum bouillon cultures or to bacterial deposits, even with the use of high concentrations, did not show a positive germicidal effect. However, the result was positive when the solution or the salve was allowed to act on the surface cultures of similar breeds from a distance of a few millimeters; apparently in mixed tests the amount of the fluid hinders the action of the radiation. How the therapeutic use of bactericidal effect is influenced must be shown by tests of the bacterial secretion.

3. Regeneration of the corneal epithelium: Since the curative effect of radium and like substances on tumors depends on the elective injury of new quickly grown cells, it seems that regeneration after shaving of the corneal epithelium by thorium X salve is hindered. However, tests show that treatment with thorium ointment leads to more rapid epithelization than is attained by pure petrolatum in the control eye. When high concentrations are used (10,000 electrostatic units per gram), the relationship is changed. These, however, are concentrations which can never be used in the eye, since they cause serious injury to its tissues: inflammation, necroses, vascular changes, falling of hair and depigmentation.

Effect of Roentgen Rays on the Eye. Dr. Jess, Giessen.

Besides the direct rays which can cause injury because of insufficient protection of the eyes, there are also the scattered rays (Streustrahlen), which, in irradiation of the cranium, reach the eye from the back, and are sources of danger to the epithelial organ and the lens of the eye as weaker rays. Dr. Jess reported two

cases in which, three and one-half years after irradiation of a tumor of the pituitary body and of nasopharyngeal fibromas, typical posterior cortical opacities were diagnosed as cataract caused by roentgen rays. Protection from these scattered rays is hardly possible, since only one of the lead dishes fastened around the eye can be responsible for them. The fact that opacities of the lens do not occur in all cases in which similar radiation therapy is administered is due, perhaps, to the various degrees of individual sensitivity. Such late injuries of the lens must always be taken into account, and the patient must be warned about them, when they can give no contraindication with regard to the life-saving effect of roentgen treatment in tumors of the pituitary body. New methods will be used in the future, perhaps, in the therapy of nasopharyngeal fibromas. In conclusion, the speaker reported a case of "cataractophobia" in which congenital pointlike opacities were considered as incipient roentgen cataract by an x-ray technician.

DETERMINATION OF THE DOSE IN LIGHT TREATMENT OF THE EYE. DR. HOFFMAN, Königsberg.

In therapeutics of the eye, as in the bordering departments of medicine, exact dosage and uniform designation is necessary in light treatment. A reliable process of measurement must be in a similar degree as the object of radiation in the same spectral territory. For practical use in therapy of the eye, the technic must not be troublesome, must not take a great deal of time or must not cost a great deal. On this basis, all the known physical processes of measurements are unsuitable for practical use. A biologic unit would, therefore, be preferable, if it could be exactly designated and possessed a small breadth of dosage. The "conjunctival dose" has been used as such a unity, and is that number of rays which causes a marked hyperemia, with superficial necrosis in the conjunctiva tarsi of a rabbit. After a year's experimentation in the Königsberg clinic, it was found to show a sufficiently exact correspondence to the conjunctiva of man, with regard to the effective spectral portion as well as to the strength of the reaction. Distinctions in the number of rays from 30 to 50 per cent show significant distinctions in the effect. The conjunctival dose is the number of rays which the Königsberg clinic used in most cases of ulcus serpens, pannus crassus and tuberculous episcleritis in a single sitting. In the testing of the power of radiation lamps, photochemical methods were suitable, especially photosynthesis, and the formation of "pentabromaceton" from citric acid and bromine water. Under exact controlled conditions which were carried out individually, the reaction appeared sharply and clearly in the same time as is necessary for the conjunctival dose. Its territory of sensitivity does not correspond entirely, however, to that of the cornea and the conjunctiva. Therefore, it cannot replace the biologic gage, but can only be used for testing.

DISCUSSION

DR. STOCK, Jena: Late cataract after roentgen treatment is familiar to me. I have described a corresponding case. Now I have at least twenty-five cases of tumor of the pituitary body so intensively treated that the hair is falling out, and yet they have shown no development of cataract. On the contrary, I have seen such cataracts in cases of much smaller dosage. If these cases are studied, it can be seen that the people who suffer are those who have epithelial diseases, such as eczema and lupus. It is dangerous to treat such people with irradiation; I believe that they are especially disposed to opacities of the lens after roentgen treatment.

DR. FLEISCHER, Erlangen: I do not exclude the possibility of injury to the lens as described by Jess; but, on the basis of my observation of a young man in whom ten years after irradiation of the glands of the neck in the angle of the lower jaw, a cataract gradually developed besides the increased reflexes, I would point out the possibility of injury to the parathyroid glands.

DR. HOFFMAN: Professor Jess believes that cataract after irradiation of tumors of the pituitary body has been caused by secondary rays outside the cone of rays. According to the investigations of Hohlfelder, Bornhauser and Yaloussis, radiation outside the cone is minimal. Cataracts can only originate, therefore, when the eye is found within the cone of rays. Therefore, I believe with von Szily that small fields should be used in the irradiation of tumors of the pituitary body, since in this way injury to the portion not concerned can be more easily avoided.

PARENCHYMATOUS KERATITIS IN SLEEPING SICKNESS. DR. STOCK, Tübingen.

The speaker observed in a young man, aged 22, who was infected with *Trypanosoma gambiense* during a two year sojourn in Fernando Po, a case of bilateral, acute parenchymatous keratitis in which he produced cure in eight days with "germanin." Before treatment, trypanosomes were numerous in the blood; after the first injection of "germanin," they disappeared, and after completion of the cure they did not again appear after four months.

This case shows that motile germs may wander into the intact cornea and then through general treatment can be removed. This case also indicates that science has found a means of treating sleeping sickness which can make life possible in infected regions.

DISCUSSION

DR. E. FUCHS, Wien: At the beginning of the century, I visited Robert Koch on the large island near Victoria where Koch had gathered about 300 or 400 patients suffering from sleeping sickness. I studied the patients with regard to pupillary reaction and background of the eye. I found the first four cases of blindness due to sodium arsanilate, but not a single case of disease of the cornea, which is a rare complication in sleeping sickness.

TREATMENT OF PARENCHYMATOUS KERATITIS. DR. B. FLEISCHER, Erlangen.

Fleischer pointed out the relatively unfavorable results of parenchymatous keratitis; only 60 per cent of the patients regain a useful visual power (from 5/5 to 5/20); 13.5 per cent have a visual capacity of less than 5/50, and the results in the rest remain between these two extremes. Recurrences are not so rare; a rather large number of patients finally enter institutions for the blind: according to Igersheimer, 10 per cent, according to an American reckoning, 24 per cent, according to an English one, about 12.9 per cent, and according to still another, 21.5 per cent of children are blinded as a result of parenchymatous keratitis. The cause of this is found in the well known slight influence of specific treatment on the course of the disease. Fleischer studied the results of unspecific treatment in the clinic at Erlangen from 1900 to 1920. The results are the same as those attained by specific treatment in the same length of time. Up to now, specific treatment has had no influence on the end-result of the disease, nor on the general condition of the patient, as is seen from the almost always unsuccessful influence of the Wassermann reaction. Improvement, whether specific or unspecific, in treatment will have to be sought, perhaps in the development of the therapy of irritation or in local treatment (irradiation). Fleischer's tests with the treatment

of malaria in four patients have as yet given no worthwhile results. In intervention treatment, trials should be made with caution and should be continued, especially in fresh cases.

DISCUSSION

DR. THIEL: I would like to point out two things of importance in the treatment of parenchymatous keratitis: 1. In the examination of patients in the city hospital in Friedrichscheim it was found that old people, who had had typical parenchymatous keratitis in their youth, presented changes in the posterior section of the eye, which offered the characteristic signs of myopia. Refractometrically the eyes also showed the evidence of myopia. In a child who had had parenchymatous keratitis of both eyes, a case of unilateral hydrophthalmus developed three years later. Perhaps this same injury (rise in tension in the inflammatory stage) led to a linear expansion of the eye. Perhaps the interesting experiments of Franceschetti offer a possibility of sending medicaments (arsphenamine) into the inner portion of the eye, the passage of which has not yet been studied.

THE OXIDATION-REDUCTION POTENTIAL OF THE RETINA. DR. M. NAKASHIMA.

Starting from the phenomenon that the extract of the retina can aid in the photoreduction of the hemoglobin of the silver or copper salts, I have studied the oxidation reduction potential of the retina and its extract with Dr. Hayashi.

The initial value of the electromotoric power of the retina and its extract seems to vary with the condition of adaptation of the latter, and the kinds of fluid in suspension; its p_H value and the concentration of the extract, especially, have great influence on it. But we are only interested in the change of the electropotential through exposure to light; thus, the initial value will be left out of the question.

When the retinas held in suspension are exposed to light, the electropotential rises suddenly, for example, from 10 to 12 millivolts for a retina in 1 cc. of fluid, and then becomes constant. At darkening, the potential rises quickly at first, then goes down slowly, but usually remains somewhat higher than at the initial value.

As for the retinal extract, the same rise and fall of the potential can be shown at exposure to light and to darkness. The amount of the fluctuation of the potential is not always the same in different conditions. For simplicity, half the symbol dE may be used, that is, the fluctuation of the potential which is not accounted for in a retina in 1 cc. of fluid.

The retinal extract of a concentration of 200 retinas in 20 cc. of fluid doubly thinned with physiologic sodium chloride solution shows a fluctuation of the potential of about 50 millivolts; therefore, the erythema dose is + 10 millivolts.

This fluctuation of the potential depends on the strength of the light. But the exact relation between the strength of the light and the fluctuation of the potential could not be determined.

The hydrogen concentration exerts a great influence on the fluctuation of the potential. Changes in the electromotoric power at exposure to light is smallest in a p_H 7.7, and with added and subtracted p_H values it becomes greater.

This fluctuation of the electropotential of the retina and its extract at exposure to light is reduced by the long duration effect of toluol up to a minimal degree, and is destroyed by the addition of neutral copper salts. On the other hand, it is increased by the addition of salts of iron.

By the addition of a thinned solution of potassium cyanide, the fluctuation of the potential is reduced to one-fifth; but this slight fluctuation cannot be brought about again for quite a long time.

The retinal extract contains a large amount of lipoids, some small amounts of albumin substances and 0.003 mg. per cubic centimeter of iron. From these facts, it can be inferred that lipoids and iron have an important part in the matter.

The fluctuation of the potential at exposure to light and darkness shows that oxidation occurs in the retinal substances on exposure to light. With Kubowitz I studied the change in the consumption of oxygen in retinas of frogs on exposure to light, according to the manometric method of Professor Warburg. However, we could not determine the anticipated increase in the consumption of oxygen. This seems to disprove the result of the measure of the potential. But if one follows Rapkine and says that there are two kinds of oxidation — oxidation with the need of free oxygen and oxidation in which the oxygen consumed comes from complex molecules — this phenomenon can be explained without difficulty.

But the theory of the oxygen reduction potential rests on oxidation in a further sense. By oxidation in a further sense is meant the splitting off of electrons. The reverse process, that of the taking up of electrons, is designated as reduction. Therefore, one can affirm that on exposure to light, the retinal substances give off electrons. This is a case not only of oxidation in a further sense, but also of the light-electric phenomena. Unfortunately, I cannot for the time being distinguish to which of these two types of giving off of electrons the phenomenon actually belongs.

The visual purple fades out almost completely through the first exposure to light, but the fluctuation of the potential can be caused again by repeated exposure to the light. An increase has even been observed after a fading of the visual purple.

From this fact, one can conclude that the visual purple is not of great importance in such a strong exposure to light.

Scientific Meeting, Aug. 8, 1928

HERR LENZ, *Chairman*

USE OF THE COBALT LAMP. DR. F. RÖSSLER, Bozen.

One thousand eyes were examined with the cobalt lamp for correction of ametropia. The subjective determination is more easily possible than, for example, a photograph of the field of vision: (1) because the photographs seen are always sharp — the change in focus is eliminated, while in other methods this is not completely effected; (2) the branch defects (Astfehlen) are increased to twice the number (chromate-increase), and there are unusual pictures of astigmatism. Therefore, it is explainable that of eighty children from 10 to 14 years of age, only two were unsuccessfully examined by this method; one was color-blind; the other gave unreliable answers.

A comparison with corrections and ophthalmometer measurements (Javal's formula) shows the superiority of the cobalt lamp. For 57.5 per cent, the total astigmatism was not only the degree but also the axis other than the corneal astigmatism.

Of 1,000 eyes, forty (4 per cent) were not suitable for examination by this method (eight color-blind); fourteen had central scotomas, and nineteen had congenital weak sight, because of strabismus and corneal opacities.

In general, the astigmatism could be determined as well by its degree as by its axial position, especially the small degrees, the correction of which is of

greatest importance. Whether or not astigmatism was marked could be easily tested by the glass placed in front.

Next in number came the cases of asymmetry and decentration.

Lower degrees are no hindrance to a good visual acuity, but higher ones are. Often, the corrective portion of the astigmatism is small; such are the cases in which the smallest cylinder, which still gives good visual acuity, is the best.

The position of the axis can be best determined by the "chromatic" method; therefore, it is best suited to explain the problem of a displacement of the axis in astigmatism.

In 1,000 cases, there were seven of changes in the axis; the condition sometimes appeared during examination or from two to seven months later in a later examination.

Besides cases of anomalies of the oblique bundles, there were also changes in the axis of the eye which showed no torsion.

In refraction defects of the cornea or the lens, incipient cataract (cataracta coerulea), and in precipitates, too, there were multiple dislocations of the light photograph (several red points, which could not be united).

In five cases of pronounced keratoconus, indications were seen of several concentric alternate red and blue circles which were sometimes complicated above or below because of ray formations.

Three other cases showed these rings, but keratoconus could not be determined with the keratoscope. Absence of the crystalline lens can also be corrected with the cobalt lamp, but one should take care that the eye looks through the middle of the glass, since besides the astigmatism of oblique bundles one may get also the prismatic effect.

The cobalt lamp is also useful in the examination of patients who apply for accident compensation, for the examination can be performed more easily through these unusual methods. A rough examination of the color vision may also be made. This method, which has become valuable in practice, is also suitable for purely scientific research. The problem of cylinder correction and change of axis can be better solved in this way than in any other.

Spastic and Tetanic Changes in the Retina in Eclampsia. Dr. Mylius, Hamburg.

Mylius studied the vascular system of the retina in eclampsia and pre-eclampsia for the presence of spastic and tetanic vascular processes. He succeeded in acquiring excellent proof of such processes in the arterial system of the retina by repeated experiments with eight or twelve cases, and illustrated his ophthalmoscopic results by pictures of the background of the eye made with the Nordensohn camera. The pictures which condition these processes are surprisingly manifold. In mild forms, bowl-like dippings pass over the vascular branch, are quiet for a time and then begin moving again. These changes may be marked especially in the initial stages; then they are absent for a time, and finally they return again. They change the outer form of the vascular cylinder, give it a spindle, bead-like or wreathlike form, without deflecting the vessel from its direction as in pulsation. These peristaltic-like processes must be considered as the expression of the spastic changes in the condition of the musculature. They may be transformed in changes of form which remain thus for a long time, so that one would then be speaking of increasing convulsions, of tetanic conditions. These milder changes may condition pictures of narrowly circumscribed indentation, or, here and there, changes of the vascular branch, and they lead to the appearance of accompanying streaks. Thus, pictures are formed which, without knowledge of the past

and without further examination, may falsely lead to the diagnosis of serious organic changes in the vessels. All these changes indicate their purely functional character through general but complete return after interruption of pregnancy. If these spastic and tetanic processes are primarily the visible expression of purely functional changes in the musculature of the vessels, as would be indicated by their disappearance, shown by photographs, it can be understood how in later anatomic examinations, no vessel changes are found or at least only slightly developed ones. It must be assumed, however, that they pave the way for organic changes in the vessels. So that even if the streaks observed in all these cases disappear, they form the connecting link between purely functional and truly organic changes.

In the course of several cases, the development of changes in the retinal tissue could be observed. It was striking to observe that an increased filling of the veins always preceded the formation of plaques and edema, and that once in branches of the vessels distal to the spasm, a retarded flow was observed before the appearance of retinal changes. Therefore it must be assumed that the appearance of these retinal changes is not an anemia (Vollhard), but the accompanying hyperemia of a retarded flow in the vessels distal to these processes and principally located in the capillary system. That the vascular systems distal to the spastic tetanic processes are frequently dilated can no longer be doubted, and once Mylius demonstrated that there was a granular streaming; this theory, therefore, already has convincing objective support. If this determination should be absolutely confirmed by later studies, it will also be proved that there are changes in the capillaries of the retina similar to those in the capillaries of the fingers, where in many cases of eclampsia it can be shown that there is a dilatation and a retardation of flow up to a stasis of long duration. He did not find similar processes in cases of retinitis albuminurica, so that he believed that a strict distinction should be made between retinitis gravidarum and retinitis albuminurica.

DISCUSSION

DR. SCHEERER, Tübingen: Did the speaker observe pictures in his cases which, in other conditions, would have signified "visible emboli"?

CAUSE AND FATE OF CASES OF IRITIS. DR. VOM HOFE, Jena.

The etiologic division of cases of iritis is difficult especially when one is dealing with the so-called tuberculous and rheumatic forms. Nodular iritis (Knötchen-iritis) is rare in Thüringen. Examination with slit lamp reveals, in most cases, a great similarity of the clinical picture. There has always been an inclination to regard the coarse fatty precipitates of accompanying cases as being tuberculous. On the contrary, in connection with operation for cataract, creeping inflammations were observed with the same precipitates. In patients of advanced age, one will hardly be able to decide on tuberculous etiology. The general observations seldom point to symptoms of active tuberculosis. The tuberculin test leaves the diagnosis in doubt; focal reactions are infrequent. This great uncertainty in the etiology will cause one to decide on tuberculosis when, aside from the general observations, some proof is shown by the history and by the chronic and recurring course. The conditions are somewhat better in rheumatic iritis, although this disease sometimes develops without other rheumatic phenomena. As for the overestimated importance of diseases of the teeth, it is shown that the improvement following the operative removal of a granuloma of the root cannot be regarded as an absolute proof of their etiologic significance. We do not know how important the destruction of

blood and tissue is in the cure. Sometimes iritis gives us a favorable field for autohemotherapy and other albumin therapy. In more advanced age, when there is the greatest frequency of carious teeth, remains of roots, etc., the frequency curve of iritis falls. In 200 patients treated by me it rose from the first to the third decade of life, and then fell until at the fifth decade there were only half as many cases as at the first. About the same number of men and women were affected. No influence of the time of the year could be found. In 9 per cent of the cases there was rise in pressure. As for the etiology, determination is made difficult by the presence of other diseases. In 200 cases observed from 1920 to 1927, I found 14 per cent of cases of syphilis. In 32 per cent there were evidences of tuberculosis, in 1 per cent of syphilis and tuberculosis together. It was possible to find ground for the diagnosis of muscular or articular rheumatism in 19 per cent of the cases. Diabetes was present in 1 per cent, gonorrhea in 2 per cent and malaria in 0.5 per cent. In 29 per cent, I could find no proof of disease. There was one slight case of chronic tonsillitis, and 1 per cent of the patients were suffering from diseases of the accessory cavity. The presence of gout could not be determined. Seventy patients were reexamined. In 58 per cent, the visual acuity was hardly injured (from 5/7 to 5/4). In 41 per cent, the phenomena which followed were serious. In 20 per cent, unfavorable endings were shown (visual acuity below 1/10). Of the patients from 1923, 41 per cent were free from recurrences for five years, and had suffered from iritis only once. Often in these the etiologic explanation is difficult. For lack of other factors, the diagnosis of tuberculosis as a way out often acts as a psychic insult to the patient.

DISCUSSION

Dr. Franceschetti, Basel: The difficult judgment of cases of iritis should be greatly aided by examination of the speed of the sedimentation of the erythrocytes. Series of experiments have shown that there is in cases of rheumatic iritis a marked acceleration of the sedimentation speed which permits reasonable distinction between this form and the tuberculous and gonorrheal forms.

Replacement of the Vitreous. Dr. C. A. Hegner, Lucerne.

Dr. Hegner's investigations proved that the cerebrospinal fluid which is related to the aqueous in its formation shows a harmless and reactionless substitute for the vitreous when introduced into the eye. Good results were attained when the vitreous was removed from the eye by suction and replaced by the same amount of cerebrospinal fluid. Following hemorrhages caused by a traumatism, the results were encouraging; the vitreous became brighter and the function of the eye was improved. Opacities of the vitreous caused by iridocyclitis could not be treated by this method.

The proceedings of the treatment are: First, lumbar puncture is performed, and a few cubic centimeters of spinal fluid are taken up in a sterile dish. Then, the conjunctiva is split, and two sutures are laid which are knotted after operation. A puncture in the sclera is made with a thin knife, and the cannula is put into the vitreous space through the small opening thus made. One can remove 1.5 cc. of vitreous and replace the same amount of spinal fluid.

Alternating Relationships Between General Blood Pressure and Some Diseases of the Eye. Dr. Horniker, Trieste.

A clinical case is reported in which a preretinal hemorrhage of the macula occurred with rise of blood pressure, and the entoptic phenomenon was suddenly

not visible. The speaker studied the question of whether the difference in the capillary tonus corresponded to a different condition of the blood pressure of both brachials. Examination of 1,100 patients, and 1,914 bilateral measurements of the blood pressure determined that the differences of the sides in blood pressure, which were only rarely observed, in well defined pathologic states, are a rather frequent occurrence.

From this point of view, it was seen that: 1. In the group with positive vasoneurotic signs, there were more women than men (600 women, 253 men). 2. This group contained a great number (57 per cent) of cases with differences in blood pressure on the two sides varying from 15 to 70 mm. of mercury, while in the other group the number of cases with similar blood pressure were in the majority. 3. The group in which there were differences in blood pressure usually showed lower blood pressure on the left side. 4. Lower blood pressure on the left side was constant in a great number of the cases. The cause of this characteristic must be said to have been anatomic peculiarities such as appear in older patients in arteriosclerotic changes of the aorta and the larger vessels, in young patients in an inferiority of the vascular apparatus and in vasoneurotic patients (narrow aorta, mitral stenosis, congenital syphilis, differences in the width of the lumen of the brachial). 5. A great number of the patients showed constant fluctuations, not only in the height of the blood pressure, but also in the changing of the lower blood pressure. These patients are in the group with positive vasoneurotic signs in all periods of life, as opposed to the group with negative vasoneurotic signs which appear from the age of 50 on, and can be said to be the expression of a functional "dysergy" in the vascular system characteristic of the vasoneurotic diathesis.

Investigations thus far have emphasized the relationship between glaucoma and blood pressure and have made only one determination of the blood pressure on a brachial, so that fluctuations in the blood pressure are not taken into account. But the frequency of the differences in pressure on both sides has caused a revision of this relationship.

Of the thirty-six cases of glaucoma which were observed, thirty-two showed a positive vasoneurotic sign.

Part of the patients had low blood pressure, with small fluctuations, and all the signs of more or less marked arteriosclerosis. All the rest (the majority were hypertonic) showed great fluctuation and marked differences in blood pressure on both sides.

From these observations, it is seen that the first stage of glaucoma is accompanied by high blood pressure and fluctuation and differences in blood pressure on both sides, so that the higher blood pressure is often found in the glaucomatous eye.

It is apparent that in the pathogenesis of glaucoma the factor of blood pressure is important, not because lasting rise in blood pressure can cause glaucoma but because at times a sudden, often unilateral, rise in blood pressure may lead to glaucoma. A second factor of local nature is concerned, and the psychic factor is also important.

Investigations of cases of hemorrhages and disturbance of circulation in the eye (subconjunctival ecchymosis, hemorrhages of the vitreous, sudden opacities of the vitreous, thrombosis of the retinal vessels and retinal hemorrhages) show that in intra-ocular and subconjunctival hemorrhages there is a rise in blood pressure past the median point. Frequently, the rise in blood pressure is limited to the side of the hemorrhagic focus and is even demonstrable after several days, although not as strongly so as at first.

Just as blood pressure influences conditions in the eye, so a number of facts make it apparent that the eye can influence the blood pressure.

This is made possible by pharmacologic means (epinephrine, histamine). There are certain reflexes (Aschner and Bernstein reflexes) which have a significant vasomotor effect by way of the sympathetic vagus system. Attention is called to the theory of Mackenzie and Head which was developed by Knotz, Wernoe and Gygurina and which has to do with unilateral reflexes and unilateral remote reflexes. An effort was made to indicate the differences in blood pressure of the sides, those of the splanchnic region or those of the cerebral region as released unilateral reflexes of vasomotor character. In various diseases of the eye, especially those in which there is also a marked tension of the capsule of the eyeball, asymmetry in blood pressure could develop through such unilateral remote reflexes.

Optic Ophthalmologic Accuracy. Dr. E. Weiss, Charlottenburg.

The accuracy of the numerical results is not correctly estimated in the mathematical treatment of optic ophthalmologic problems. The calculated result never shows a higher percentage of accuracy than that attained by measurement. Calculated results, which are derived from special assumptions, should never be generalized. Thus, the data for the Gullstrand schematic eye are not to be understood as if the actual emmetropic eyes show this exact amount on 0.2 per thousand. Variations up to 10 per cent appear. Therefore, the calculation of an "absolute" visual acuity is illusory. Numerous results of calculation may not be transcribed from related formula (for example, Tscherning's curve) without further treatment of the actual conditions (form of punctal glasses), because great variations result in some circumstances through exact calculations. In all cases, an unscientific and practically purposeless exaggerated apparent accuracy must be avoided. For this reason, all measurements in the eye (for example, the distance of the vertex of trial glasses) should be made with the greatest possible accuracy, because otherwise failures are inevitable.

Determination of the Turning Point of the Eye. Dr. Hartinger, Jena.

In Helmholz' manual of physiologic optics, it is explained that the turning point of the eye is not to be considered as a mathematical point. The variations are slight, however; they are inevitable, judging from the great number of errors in the discovery of visual aids, for example. A work of Herr Schaap written in Dutch appeared in 1927. The title is "Investigation Relative to the Turning Point of the Eye." Schaap used a method suggested by Snellen and Koster. The mathematical treatment of the problem is insufficient in Schaap's article. The turning points supposedly attained by Schaap are kinematically without significance with respect to the equivalent turning points, for he did not measure the longitudinal displacement of the eye. Through examination of six eyes, he found that one cannot speak of one turning point of the eye in general.

If the measurements are made according to Koster's technic, the longitudinal displacement of the eye being taken into consideration, with a tool which makes possible the necessary accuracy for the determination of the conducting direction of the rays (Leitstrahlrichtungen) and the position of the corneal vertex, entirely different results are obtained. It is still necessary that special modes of action be used to hold the head. Besides a chin support, a dental impression compound and the usual metal plate, a special support for the head is also necessary.

The investigator must make three measurements for each direction of the conducting rays (Leitstrahlrichtung), and after each measurement must indicate the beginning position. This testing of the stationary position of the head is followed by accuracy when the apparatus is used.

Six equivalent turning points were attained for each eye which were determinative for the turning from a straight line 10, 20 and 30 degrees to the left and right. A good view of the result is obtained if these equivalent turning points are drawn in a Gullstrand schematic eye. Of the six eyes examined, three were normal, two were short-sighted or astigmatic and one was far-sighted. For the normal eyes, the turning point was from 13 to 14 mm. behind the vertex of the cornea, while the distance for far-sighted eyes was smaller and for the short-sighted eyes greater. The entire measurement process was repeated for four days in emmetropic eyes in order to find the temporal fluctuations in the position of the turning point. It was shown that all twenty-four equivalent turning points were located within a circle of a radius of 0.5 mm. For the eyes of the investigator, the turning point must be 13.5 mm. behind the vertex of the cornea and only a few tenths of a millimeter to the side of the relative axis and the conducting ray. My results justify the decision of a single turning point for the eye for the turning of the eyes in a horizontal plane and for the purposes of optical calculation.

A New Double Focus Pair of Glasses. Dr. H. Spanuth, Rathenow.

From the aesthetic and optic point of view, a double focus pair of glasses makes certain demands. In addition, the form of the near portion should be suitable. It is conceded that thus far bifocal glasses have not been completely satisfactory.

I believe that the use of a new type of glass called telesin glass will make a great improvement.

The form of the new portion is better than that in the old glasses now. It is widest at the upper edge, and this lies in the middle of the entire glass. The near portion of the double focus glasses is used principally in reading; the writing line has its principal extension horizontally. Thus, the use of telesin glass does away with the movement of the head and the glancing down. There is a narrow zone under the near portion for action at a distance, this is much to be desired in stepping up or down.

The optic middle point of the near portions lies, like that of the far portion, in the middle of the upper line of division and coincides with the geometric middle point of the entire glass. The optic axis of the near and far portions goes through the turning point of the eye.

Since the far portion of the glasses is of the punctal variety and the most important part of the near portion lies in the middle of the glass, the near portion is sufficiently free from astigmatism of oblique bundles.

The faulty picture in the upper portion of the dividing line is avoided.

Through the use of a strong (hochwertig) special kind of glass, it is possible to reduce the chromatic aberration to a minimum. A slight aberration in color appears at the edge of every pair of spectacles without disturbing the person who wears them. The lens of the near portion is fused in, and the surface is uniformly ground. Thus, the near portion is inconspicuous, is durable and never presents a step or a crevice in which dust can collect.

Telesin glass is manufactured by Busch, Rathenow Company. It is not yet procurable, but will be next month.

DISCUSSION

DR. NORDENSON: I have undertaken experiments with the turning point with a simple apparatus. In future investigation, it would be worthwhile to distinguish between the mechanical and optical turning points. If an optic turning point were not present, the bundle of conducting rays would be narrowed, if it were not too far, and its relation to accuracy would be important and could be determined with the glasses and instruments concerned.

DR. VAN DER HOEVE: Herr Schaap has determined the turning point carefully with Koster's apparatus. Now we hear that Herr Hartinger has attained different results with an improved apparatus of Koster's. I believe that various investigations will be necessary before we come to a decision. In one of Dr. Hartinger's investigations, it is seen that the turning point lies 2 mm. to the left of the middle, in another 2 mm. to the right—a difference of 4 mm. This is such a great difference that it should not be neglected. I hope Dr. Hartinger will change his apparatus so that it can be used in other meridians. We are now making a new apparatus in order to make possible the measurements suggested by Dr. Nordenson. Perhaps we can investigate with other apparatus, with Professor Henker's apparatus, for example; the latter must work very exactly. Thus far, no exact tests have been made with it. Brennecke's tests gave the same results as those of Herr Schaap, but were discarded as being inaccurate.

DR. HARTINGER: I agree with Nordenson. In general, the turning of the eye takes place in such a way that a surface fixed in space rolls off on a surface connected with the eye, as Herr Gullstrand explained. For movement in a single plane, one comes to the group of lines mentioned by Nordenson. I believe that for optical purposes the determination of several equivalent turning points is practically sufficient.

In answer to Professor van der Hoeve's remarks I intend to change the apparatus so that investigation will be possible in several phases.

TESTS OF AFTER-IMAGES. DR. W. JABLONSKI.

In general, it is difficult, in conditions which afford a good complementary colored after-image of a colored object, to obtain an after-image of an entire field of a similar color. The mere increase in the size of the pattern cannot account for this. It can be determined that in central fixation of an object the increase in size of this object over a visual angle of from 2 to 4 degrees reduces the duration of the after-images. This reduction comes from the size of the pattern and not in the excentric consideration of the object. Both facts can be explained by the effect of contrast in the amount of contour in the proximity of the fixation point. Tests show that contour is considered as contrast for the quality of the after-images. In the usual after-image test, the flow in the brightness (Helligkeitsprung) of the figure is considered as basic in addition to contour. Equal brightness causes a decrease in the duration of the after-images. Here one reaches the "critical zone," which is distinguished by a complete disappearance of all outlines (Liebmann: Psychologic Investigation, 1927, vol. 9); thus, after longer exposure, one gets a blended image which resembles an after-image. Distinction in colors affects the after-images markedly. The enclosed nature of the figure seems to have no great importance as opposed to the contour. The "half-field" formed from the contour separated from an entire field of vision gives better after-images than a figure of favorable size. The after-images of the "half-field" and those of the "whole-field" were tested with a special apparatus in the Berlin Psychologic Institute. This apparatus permitted the entire field of vision to be

colored uniformly. It was shown that the "whole-field," which does not contain the factors discussed, produces complementary after-images. The after-images are obtained only after a prolonged time of exposure, and they are greatly contrasted with the after-image (Figur-Nachbild) of the object by a series of peculiarities. Theoretical inferences were made, and remarks were made on the periodicity of after-images (Comberg) as a phenomenon of plateau oscillations.

DISCUSSION

DR. JABLONSKI: Tests were made with the exclusion of outer light. The results were similar in nature.

AIDS IN ACCOMMODATION. DR. ERGGELET, Jena.

In the usual glasses for older people, the contracted region of accommodation is placed in a suitable portion of the working space. Necessity to see clearly at different distances makes different glasses necessary, and when they must be changed frequently during work, folding glasses, drops and other types of change increase convenience. Thus, the field of vision is kept unchanged in each distance. If the adjustment to a different distance is length, then sacrifices are made in the field of vision in which the disk of the glasses is divided into different regions of different strength, as in glasses of two or more kinds of strengths. Lauber's accommodation glasses make possible adjustment from 25 cm. to infinity by changing the refractive power of the glasses. This depends on the change of the space between the joints of the lens. Dr. Erggelet reported another means of accommodations. He began with the fact that adjusted glasses in the final distance before the eye give the near-sighted person a larger and the far-sighted person a small results of accommodation, as they give him an impression like that of one whose sight is normal. The exterior result of accommodation can be raised for the short-sighted person by a shifting of the posterior point of union of the focal planes and the axis of the glasses toward the direction of the light. If the posterior axis of the glasses remains in place, there the displacement is attained by the use of a pair of lens in which one is led forcibly to a diminishing pair of glasses, a reversed kind of telescope glasses.

The length of the tubes (Rohrlänge) the thickness and the refracting power of the lens have an influence on the power of accommodation. The valuation of the formulas in simplified assumptions as they have been determined through the desire for aids in accommodation shows the amount which can be attained and the necessary amount of diminution. They are also given in an arranged form. If one wishes to raise the result of accommodation in order to approximate the breadth of accommodation at the beginning of trouble with the eyes in old age (about 4 diopters), the increase must be from 4, 3 or 2 diopters, and four times as great for a remaining accommodation of 3, 2 or 1 diopters (a certain remainder must naturally be present). For this, a diminution of 0.88, 0.72 and 52 is needed. Such distance glasses can be easily made. There is a question as to how the diminution (reduction) can be put on a support. The speaker showed two kinds of glasses which were made for him by Zeiss. With the help of their diminution of about 0.6 to 0.8, a raising of the accommodation to from 2.7 to 1.5 times results. The faults in representation in the field of vision are greatly lessened, so that they can be used in testing the diminution and accommodation. The eye is sensitive to diminution at times, because of its consequences at the perception of space. Thus, the strongly reducing glasses are not desirable. The diminution (reduction) of 0.8 seems to represent, in some degree, the limit of endurance. An

increase of over 1.5 times is excluded; that is, the lifting of the width of accommodation from 2.7 to 4 diopters, if one considers the example of an older person in need of glasses. The region which can be used is limited. Convergence of the axes of the set of lens would permit an increase of the field for both eyes. The lens which is fastened in front (Vorstecklinse) makes the territory somewhat wider.

PERCEPTION OF SPACE AND TONUS. DR. H. KLEINT, Frankfurt a. M.

If one tried to turn the head of the person being tested in a vertical axis with an apparatus constructed by Mach, while he fixates a luminous point in the darkness, an apparent displacement of the point of fixation is shown by the unchanged position of head and eyes — a sideward inclination of the line toward the side opposite the turning agency. The phenomenon disappears with the setting-in of the release (relaxing of the turning factor used on the head) — indeed, the line bends toward the other side.

A similar phenomenon appears at the lifting of two different weights. After-images show the condition as the images of perception, for example, the after-image of a vertical position is bent toward the side on which the heavy weight is held.

Further investigation of Kundt's division test in different tonus effects gave certain results according to which space values belong to the retinas. But one can no longer speak of stability according to Hering-Hillebrand.

SOCIÉTÉ DE NEUROLOGIE

P. BAILLIART, M.D., *Reporter*

International Neurologic Meeting, July 3 and 4, 1928

DIAGNOSIS AND TREATMENT OF CEREBRAL TUMORS (*Ann. d'ocul.*, October, 1928). J. BOLLACK and E. HARTMANN.

If Bollack and Hartmann were not ophthalmologists, and excellent ones, they could be neurologists, and excellent ones too. That is the reason why the Société de Neurologie was particularly lucky when the ophthalmologic part of the report on "Diagnosis and Treatment of Cerebral Tumors," for the 1928 Meeting, was intrusted to them. Bollack presented the first part of the report, "Examination of the Eye in Its Relations to Intracranial Hypertension as far as Its Diagnosis and Therapy is Concerned," and Mr. Hartmann, "The Examination of the Eye as far as it Allows the Localization of Tumors."

How can the ophthalmologist help the neurologist in the diagnosis of intracranial hypertension? After mentioning certain accessory signs, such as dilatation of the pupil and bilateral, transient paralysis of the sixth nerve, as the occasional cause of intracranial hypertension, Bollack took up the examination of the fundus starting with papillary stasis, which he justly considered to be the most important. He cautioned ophthalmologists not to overlook the difficulty of diagnosis in the beginning stage of the condition. The modifications of the optic disk start at the margin (blurring hyperemia); they are especially marked at the temporal side and much more difficult to recognize at the nasal side. At this stage, frequently a slight widening and some tortuosity of the vessels are also to be noticed. These symptoms are difficult to determine. Later they become more marked. Hyperemia of the disk and modifications of the blood vessels appear; in the retina itself,

hemorrhages or whitish exudates arise; finally, edema, the chief sign, blurs the margin of the disk, increases its apparent diameter and makes it prominent.

The objective changes in the vessels are difficult to interpret. Papillary edema and involvement of the retina are not yet sufficiently distinct. On the contrary, the degree of protrusion of the disk becomes much more significant and, added to the symptoms to be observed, leads to a diagnosis of papillary stasis. However, except in extreme cases, one must await the functional signs of the stasis. These signs are missing in the beginning and the discrepancy between the almost complete integrity of the visual functions and the intensity of ophthalmoscopic signs constitutes almost a pathognomonic sign of the stasis. In the foregoing sentence which appeared in résumé, presumably by the author himself, in the *Presse médicale* for Aug. 11, 1928, the word "almost," indicates the hesitation often necessary in such a case.

The alterations of the field of vision during stasis should be interpreted in general, as symptoms of localization. One of the most helpful points in the diagnosis, however, is the fact that the visual acuity may remain normal for a long time in a case of decided stasis. Finally, Bollack insists on a final sign; "those negative characters of the functional exploration in the early stage of papillary stasis must be opposed by the particular diagnostic importance of an almost pathognomonic subjective symptom about which the patient ought always to be questioned." He would seem to admit a diagnosis of the stasis without the ophthalmoscope. There is transient observation of vision. Real visual eclipses which appear sometimes very early when the acuity is still normal are followed soon by a decrease in vision. They last but a few seconds and may recur as often as fifty or a hundred times a day; and are interpreted by the authors as due either to a paroxysmal increase of the intracranial tension or to a temporary vascular spasm of the peripheral retinal system (Harms) or cerebral system (Leber, Fuchs).

These obscurations seem to be the characteristic features of intracranial hypertension rather than of papillary stasis. They have been noted in cases of intracranial hypertension without stasis.

These functional signs establish the diagnosis of optic neuritis, of pseudoneuritis, which is found in certain cases of astigmatism and hypermetropia and the aspect of which suggests a stasis of a minor degree, or of certain papillary edemas of renal origin. In the last named condition, the diagnosis is difficult as blood pressure high enough to produce papilledema is often accompanied by intracranial hypertension.

As soon as the diagnosis is made, papillary stasis should be considered as an ophthalmologic phenomenon exclusively connected with intracranial hypertension. It may be found in in extremely different lesions, such as acute or chronic meningitis, traumatisms, complications of otitis, abscesses of the brain, ependymitis and serous meningitis, all of which may culminate in the syndrome of intracranial hypertension. In papillary stasis, however, the cerebral neoplasms are of such an etiologic importance that their presence should suggest the possibility of a tumor, excluding of course, the circumstances of their appearance.

In a number of cases, papillary stasis is not present. (According to statistics of Guillain and Lagrange, it was missing in 46 per cent of the cases.) Neither the nature nor the volume of the tumor accounts for the occurrence of the stasis. The rapidity of growth might be of greater importance (Viggo Christiansen), tumors of slow growth being accompanied variably by late papillary stasis as if the cranial cavity had had the time to accommodate itself progressively to the change in its contents. Unilaterality has only a relative value in locating the site

of the tumor. The site, however, seems to have a real influence on the development of the stasis which is almost always found in tumors of the cerebellum, of the corpora quadrigemina and of the angle of the fourth ventricle. It is found less often in tumors of the protuberance and the occipital, parietal and frontal lobes; still less frequently in the gray central nuclei, the oval center, the temporal lobe and the rolandic area; and far more seldom in tumors of the callosum of the third ventricle and of the lateral ventricles, of the peduncle, and of the bulb. Finally, it is rare in basilar and meningeal tumors. Excluding the tumors which act directly on the optic nerve, stasis is found in tumors which disturb the circulation of the ventricular arachnoid spaces and which lead to ventricular hypertension, an important factor in increased pressure in general and in stasis. In earlier work, Bollack showed the almost constant ventricular dilatation, especially of the third ventricle, in cases of stasis.

As the stasis is missing in a large number of cases of intracranial hypertension, any other way of revealing this increased pressure ophthalmoscopically deserves appreciation. Bollack considers the measurement of the retinal arterial pressure a delicate procedure, which is true; but are surgeons not accustomed to use delicate technics? The possibility of error which he mentions exists, without a doubt, but less frequently than he believes. It seems to me, moreover, that he has not obtained the favorable impression of this method from the investigations of Magitot, and especially of Claude Lamache and Dubar and from the thesis of Kalt, that the authors themselves had. But that does not matter; he is right in being cautious, too cautious, I think. He stated that it might be difficult "to judge the value of a recently applied method which does not seem as yet to be fully developed." All I wish is that Bollack would be among those who endeavor to determine its worth. In the meantime I should be glad to write as he does: "It still seems to be daring to depend on retinal arterial hypertension alone without the aid of lumbar puncture to confirm this hypertension (intracranial) and to deduce exact therapeutic conclusions." This agrees with Bollack's statement when referring to papillary stasis, that if, in the presence of a change in the fundus similar to choked disk, several of the principal elements of the syndrome are missing, such as headache or lumbar hypertension, the diagnosis of papillary stasis can be accepted only with the greatest reserve. He is even more reserved with regard to positive indications given by local arterial pressure, undoubtedly because he understands it less; in this stand, he is perfectly right. I do not want to speak of lumbar puncture as means of measuring the pressure, for, as is generally known, it is often misleading even when stasis is a fact. Who whould dare, however, in the actual state of science, except for other classic signs of intracranial hypertension, to open a skull because of the disagreement between the brachial arterial and the retinal pressure? It is another sign the value of which may be compared to that of the papillary stasis and which is useful when stasis is not present.

Bollack names the following chapter "Treatment of Papillary Stasis." He is speaking as an ophthalmologist and judges the effect of the treatment on the intracranial hypertension by its effects on the stasis; this is, as one can see, a strictly limited field.

Antisyphilitic treatment will be effective if the tumor is of a syphilitic nature or if a syphilitic meningo-ependymitis is the cause of the hypertension. But precious time must not be lost because of this uncertainty. Bollack refers to Velter's statement that all papillary stasis which resists treatment ought to be decompressed even if the presence of syphilis is certain.

Hypertonic solutions have but a transient and inconstant effect. Lumbar puncture is, in spite of some successful results, generally without result and may be

dangerous. Ventricular puncture, easily repeated, may have better results and produce regression of the stasis. It would be more useful if, since it is made through an opening in the bone, it was only an adjunct to a decompressive trephining.

The extirpation of the tumor may cause the stasis to disappear and may restore vision to its original acuity. From this point of view, however, it has no marked superiority over palliative operations. If exeresis is impossible or the tumor is not localized, how can the stasis be affected? Trephining of the sheath of the optic nerve is illusive; puncture of the corpus callosum is rational; but, above all, one must be well acquainted with the indications for a decompressive operation. The following conclusions are taken from the aforementioned résumé: If vision starts to decrease, immediate operation is urgent; the prognosis depends on the rapidity of the operation. If the decrease is already pronounced, it is still necessary to operate immediately, but the prognosis depends on the visual acuity; if from 5/10 to 6/10 of the vision remains, it is favorable; if only from 2/10 to 3/10 remains, one cannot always hope to check the decrease in vision. If the patient is blind, the intervention sometimes gives good results in cases of acute blindness which are, however, rare; in cases of blindness that developed slowly, the results are uncertain. Certain authors believe, nevertheless, that it is never too late to operate, and that trephining may still bring back a certain degree of useful vision, especially if the papilla still shows signs of edema. Thus, it could be observed that, in spite of the growth of the tumor which naturally could not be arrested by decompression, vision was maintained for several years.

As for the radiotherapy the results of which are sometimes favorable, sometimes ineffective and sometimes unfavorable, it should be used only after the decompression.

Those who will read Bollack's article will find there the maximum of clearness and practical sense.

In the second part of the paper, which is the work of Hartmann, the question of the examination of the eye in the localization of cerebral tumors is presented. Hartmann considers the information secured from the investigation of the visual functions, ocular sensibility, ocular and palpebral motility, the pupil and accommodation, exophthalmos and the organovegetative modifications.

Visual acuity may be modified by other conditions than papillary stasis. A central scotoma, first relative, then absolute, may suggest retrobulbar neuritis. The papilla may become discolored, which is most often the case in a tumor of the frontal lobe or in a tumor in the inferior part of this lobe compressing the optic nerve between the chiasma and the optic canal. At the same time, there may be papillary stasis on the opposite side.

In bilateral stasis, it may be assumed with a great deal of reserve, that the tumor is on the side on which there is least vision, assuming, if possible, that the same difference did not exist previously.

The importance of the visual field lies in the fact that the optic tracts, extending from the orbit to the calcarine fissure, offer a long area to be attacked by a tumor. Their well known relations with other fibers and other centers allow localizations which are also aided by the partial decussation of the optic nerves at the chiasm.

Nonhemianopic defects are not of great importance. These include enlargement of the blind spot, irregular concentric contraction of both fields of vision in the course of papillary stasis; and relative and later absolute central scotoma in the direct lesions of the nerve by a frontal tumor.

The hemianopic changes are much more important. As soon as homonymous hemianopia is recognized, the ophthalmologist should try to localize the tumor by the character of the hemianopia.

In case of a lesion of the optic tract or of the external geniculate body, the positive hemiopic reflex is of great value and reveals the lesion in the optic tract or in the external geniculate body. Its absence does not lead to as sure a conclusion that the opposite is true.

According to Dufour, a peripheric lesion produces a positive scotoma, the patient seeing a black spot in his visual field. A central lesion results in only a negative scotoma; that is, the visual defect is noticed only during the examination of the field of vision. Like Christiansen, Hartmann does not attach great importance to this distinction.

According to Cushing, when papillary stasis is accompanied by hemianopia, the lesion is posterior to the external geniculate body; when there is primary atrophy, it attacks the optic tract most frequently.

Hemianopia resulting from a lesion of the optic paths posterior to the geniculate body, although found sometimes in occipital or basilar tumors, suggests a tumor in the temporal lobe or in the inferoposterior part of the parietal lobe.

Hemianopia from lesions posterior to the external geniculate body is generally believed to be the sign of an occipital tumor. Although occipital tumors are nearly always accompanied by hemianopsia, the reverse is far from true. This condition is one of the most important signs of temporal tumors.

In bitemporal hemianopia, the first thought should be a tumor of the pituitary body or of other suprasellar structures. Certain tumors of the third ventricle may also be the cause. Finally, internal hydrocephalus (generally due to a posterior tumor) may compress the chiasm and produce this symptom.

Binasal hemianopia, a rare condition, may be the result of two lesions or of one; for instance, a tumor of the pituitary body lifting the chiasm, thus causing the anterior cerebral artery to compress the margins of the chiasm and the optic nerves.

In horizontal hemianopia, or association of hemianopias of the right and left quadrant, it is probable that the tumor is seated in a place where the right and the left optic paths are quite close.

Visual hallucinations may be accompanied by delirium and are attributed to intracranial hypertension. In this case, there is no possibility of exact localization. In other cases, there is no mental disturbance. Sometimes the hallucinations consist of visions of persons or scenes; there is no question of an actual lesion of the occipital lobe, as they may be provoked by any irritation of the optic tract. At other times, there are luminous spots, sparks and flying objects (abnormal visual sensations of Nida); these suggest, above all, an occipital localization, although this is not invariable.

Anesthesia in the entire zone of the trigeminus or only in the ophthalmic branch or the cornea should suggest a tumor along the whole length of the nerve. Other indications are the absence of the corneal reflex, irritative phenomena (pain, hyperesthesia and parasthesia) and keratitis neuroparalytica.

Lesions of an oculomotor nerve may be due either directly to the influence of the tumor or indirectly to intracranial hypertension.

Vertical paralysis of vision, paralysis of convergence, paralysis of lateral movements and nystagmus suggest tumor.

In pupillary lesions, on the whole, the pupils are dilated. Neither miosis nor bilateral mydriasis can furnish information as to the probable site of the tumor.

Inequality of the pupils may accompany tumors situated in any part of the brain and has no diagnostic signification.

The abolition of the photomotor reflex cannot be considered as an indication of tumor if there is no paralysis of the sphincter and if the visual acuity is sufficient. This reflex is frequently found in tumors in the region of the pituitary body and of the quadrigeminal bodies. With this condition, several authors have observed an Argyll Robertson pupil.

Exophthalmos may be bilateral without diagnostic value either when due to compression of the cavernous sinus or to influence on the organovegetative nervous system. If the exophthalmos is unilateral, there is a question, most of the time, of meningioma in the region of the affected orbit.

Hartmann then describes the various signs of tumor according to the principal locations.

The qualities of precision, clearness and personality found in the previous contributions of Hartmann on the same subjects, are found again in this article. This is a piece of work which should come to the attention of every specialist in this field.

ROYAL SOCIETY OF MEDICINE, LONDON, SECTION ON OPHTHALMOLOGY

Friday, Nov. 9, 1928

MR. CYRIL WALKER, *in the Chair*

SHRINKAGE IN CONGENITAL CATARACT. MR. D. M. CARDELL.

A girl, aged 13, with a monocular cataract, had been taken to the hospital because of a green coloration in the pupil. The patient had been short-sighted since she was a child. The refraction in the left eye was —15. The sclerosis in the lens of this eye was confined to one sector, and was of the type usually associated with injury; however, in this case there was no history of either injury or inflammation. The question was whether it was congenital or due to a detachment of the retina. Projection was good, and the tension was normal; therefore, it was assumed that the condition was congenital in origin. Mr. Cardell asked whether it was thought that operation should be done, in the form of needling, as the sight in the left eye was extremely poor.

CONGENITAL ABNORMALITY OF THE FUNDUS. MISS ADAM for MR. M. S. MAYOU.

Persistent connective tissue was present in the posterior pole of the right side and in the optic disk of the left side. The child was seen because of defective vision in the right eye; injury had not been present at birth. In the right eye the vision was reduced to the perception of movements of the hands; in the left eye it was 6/6. In the fundus of the right eye there was a large membrane which obscured the disk, and which partially hid the vessels; some extensive pigment disturbance was also present. In the left eye there was a small membrane of connective tissue on the nasal side of the disk.

DISCUSSION

MISS IDA MANN: The condition seen in the eye does not represent a normal developmental stage; the membrane is too extensive to be a mere persistence of the normal glial tissue on the disk. The appearance in the left

eye, however, is so typically that of a persistent glial sheath that it must be considered a case of aberrant development.

MR. TREACHER COLLINS: This is either an abnormal formation of fibrous tissue along the central hyaloid artery or a hemorrhage into the sheath of the hyaloid at birth, which subsequently formed the basis for the formation of the fibrous tissue.

CYST OF THE RETINA. MR. O. G. MORGAN.

The cyst was discovered when the patient was examined at school. There had been no alteration in the appearance of the cyst after a year. It was regarded as a type of Coats' disease with cyst formation. There was 3 diopters of swelling, with a greenish tinge.

DISCUSSION

MR. M. S. MAYOU: I refer to a section which I showed at the last meeting of the Ophthalmological Society which was illustrative of this condition. One of the first changes which took place in the retina was that of a separation between the layers of the retina, due to the adherence of the outer part of the retina to the retinal pigment layer and choroid, probably the result of primary changes which took place in the choroid. This separation between the layers started as a small cyst; it might progress to a complete semidetachment.

BLOOD-STAINING OF THE CORNEA. MR. O. G. MORGAN.

The patient, while playing with an air-pistol, received the discharge into his face. On the following day, a small wound was seen in the sclera; some edema of the retina was also present. After the patient had a restless and violent night, the whole anterior chamber became filled with blood; an excessive amount of tension and considerable pain were also present. He was admitted to the hospital, but there was no change in the condition for two or three weeks. A paracentesis was done, but the aqueous was pale and did not contain blood. It was therefore concluded that the disturbance was entirely in the cornea, which was red and was beginning to turn to a brownish tinge. X-ray pictures did not reveal a foreign body; therefore, it was concluded that a glancing blow of the spring had struck the sclerotic portion. Mr. Morgan did not think that there could have been a wound in Descemet's membrane. The entire cornea was equally stained with blood.

DISCUSSION

MR. TREACHER COLLINS: I have seen several cases of a blood-stained pigmentation of the cornea, and all of them occurred after concussion injuries, usually in patients who had a raised ocular tension. Blood was effused into the anterior chamber, where it became stagnant, as it was unable to escape. Usually, there was some blocking of the angle of the chamber, and the crystals of hematoidin were precipitated into the substantia propia of the cornea. Eventually, the condition always disappeared.

EXCEPTIONALLY HIGH HYPERMETROPIA. MR. F. A. WILLIAMSON-NOBLE.

The patient was a woman who wore + 20 glasses (prescribed by some one else), although she could see better with + 18 glasses. With the glasses, her vision was 6/60 with the right eye and 6/24 with the left eye. She had cerebellar signs, and was therefore sent to a hospital for nervous diseases. She was to be kept there to see whether or not a change occurred in the condition.

SENILE FORM OF COATS' DISEASES WITH EXUDATIVE RETINITIS. MR. M. S. MAYOU.

The case was considered one of osteitis deformans. Calcareous degeneration of the arteries was present.

INJURY OF THE LENS CAUSING ALTERATION OF REFRACTION. MR. A. H. LEVY.

The patient was a man, aged 31, who, while skiing in Switzerland last January, stumbled and pitched forward, his right glass impinging on the top of his skiing stick, which caused it to break. Some of the fragments of glass were driven into the eye, cutting the cornea, nicking the pupillary edge of the iris and cutting the anterior capsule of the lens. The local physician bathed the eye with boric acid and kept him in bed for eight days with the eye bandaged. After that time, he was allowed to return to England. When Mr. Levy saw him, ten days after the accident, the eye was quiet and white, although the anterior chamber contained a fair amount of matter from the lens. The substance of the lens could be seen protruding from the cut in the lens. The tension was normal, and there was no complaint of discomfort. Vision in that eye was a bare 6/60, with pinhole, 6/12. It was expected that the lens would either absorb or become opaque, but neither change occurred. The masses of matter from the lens in the anterior chamber vanished in about a month; the wound in the capsule of the lens closed up, leaving the point of injury in the lens opaque. At that time the vision with a pinhole was 6/9 partly. Two weeks later the vision was + 2.25 sphere equal to 6/12, and eight weeks after the accident, + 1.75 sphere equal to 6/9. Three months after the mishap, the vision was + 1.50, equal to 6/6 part. During all this time, the eye was treated with atropine, but at the end of March the therapy was discontinued, and the accommodation power could be measured. He had 6 diopters in the left (uninjured) eye and 2 diopters in the right. Six months after the accident, the vision in the right eye was: + 1 sphere, + 0.25 cylindrical axis 80 degrees equal to 6/6 partly; the amplitude of accommodation had risen to 4 diopters, that of the left remaining at 6 diopters.

Before the accident, the patient was myopic, 3.75 diopters in the right eye, afterward it was 1 diopter. Hence, the effect of the accident was to change a case of myopia of 3.75 to one of hypermetropia of 1 diopter.

In injuries of the lens it might be worth while before proceeding to operative measures to wait to see what nature might do.

DISCUSSION

MISS MANN: Is the healing of the wounds in the capsule of the lens the usual course in certain animals? In some experiments that I have done on the eyes of rabbits, with the object of producing cataract, needling of the lenses, in three rabbits, resulted in the healing of the capsule each time.

MR. LEVY: In animals nothing short of actual cautery seems to prevent healing.

OCULAR MANIFESTATIONS OF FOCAL SEPSIS. MR. A. F. MACCALLAN.

It was in the continuation of his previous contribution on the same subject that Mr. MacCallan set out to determine whether or not a pathologic state in any other part of the body is commonly associated with ocular defects. This second series embraces fifty patients who attained full normal vision after the correction of ametropia. Lenticular opacities were seen by ordinary focal illu-

mination in 26 per cent, and in 12 per cent as seen by the slit-lamp only; vitreous opacities were seen with the slit-lamp (including gross opacities) in 76 per cent; macular hyperemia in 14 per cent and early pigmentary changes in the macula in 10 per cent. The bodily conditions found in these fifty cases were as follows: tonsillar sepsis with operation, 10; chronic gonorrhea, 2, and dental conditions as apical abscesses, 10; chronic periodontitis, 2; buried roots, 4; obvious septic stumps, 10; history of previous sepsis, 36 and bone infection, 2 per cent.

Mr. MacCallan said that a surprising number of patients who attained full vision after the correction of ametropia exhibited changes in the eye, the most marked of these being opacities in the lenses and in the anterior part of the vitreous chambers. The character of the lenticular opacity was that which Sir John Parsons termed cataracta senilis praematura punctata. During the past year, he had not seen a case of lenticular opacity, either in hospitals or in private practice, in which some focus of septic or toxic absorption could not be demonstrated, or in which there was not a history of some such focus. The site of the infection seemed to be immaterial. Professor Elliot-Smith said that there was a bare possibility that toxic material might pass up within the sheaths of the dental nerves to the gasserian ganglion, and thence within the sheath of the ophthalmic division of the fifth nerve to any part of the eye.

DISCUSSION

Mr. C. Bowdler Henry: Two important questions arise in this connection: 1. Could the ophthalmic surgeon show that the present sepsis was active in a particular patient? 2. Could such a record be taken, particularly in regard to vitreous opacity, so that it could be compared with the condition a year or two afterward, in cases which were at first doubtful? Ninety-five per cent of the populace has defective teeth, and the great difficulty is to determine whether or not the sepsis is doing enough harm to call for intervention. In one case, there was a marked improvement in vision following a preliminary scaling of the teeth.

Mr. Cyril Walker: How soon after the teeth have been removed can one feel safe in doing a cataract extraction?

Mr. M. S. Mayou: All ophthalmologists know how serious dental sepsis is and how common; they also know how common opacities are, when looked for with the slit-lamp. It has not yet been proved that the connection between the two conditions is as close as postulated by Mr. MacCallan.

Sir Arnold Lawson: Every possible source of sepsis and other disturbances should be investigated, and the assumption should not be made that because the patient's teeth are defective that is the cause of the disturbance in the eye. I know of a case in which the patient had defective teeth, but the condition in the eye did not improve until an infection in the gallbladder had disappeared.

Book Reviews

VERGLEICHENDE UNTERSUCHUNGEN UEBER DEN BAU UND DIE ENTWICKLUNG DES GLASKOERPERS UND SEINER INHALTSGEBILDE BEI WIRBELTIEREN UND BEIM MENSCHEN. By PROFESSOR ALEXANDER JOKL, Anatomical Institute, University of Upsala. Price, $5. Pp. 249, with illustrations. Upsala, Sweden: Almqvist & Wiksells, 1927.

At the present time, the vitreous body is attracting a good deal of attention from ophthalmologists. Since the slitlamp has demonstrated a distinct structure, the vitreous body no longer can be considered an indifferent jelly. Pathologically, its importance has increased with the enormous strides made in microchemistry. This book, therefore, is opportune. To understand the structure of the adult organ, nothing is more necessary than the study of its development and comparative anatomy.

The work of Professor Jokl in every sense comes up to expectation. The subject has already a long history, and in a laudable way Jokl has given each author his due. The book, a quarto, is divided into three main sections. In the first 16 pages, the technical difficulties are mentioned, great stress being laid on normal conservation, giving Szent-Cyorgyi full credit for his method of conservation, which made it possible to study so delicate a structure in its natural state; the second section (148 pages) gives the comparative anatomy of the embryological structure and, whenever possible, the life history until the organ became adult; in the third (64 pages), a repetition and elaboration of the whole subject are given.

The human eye is discussed fully. Some incursions into the pathologic processes are made, and there are also references to discoveries made by the use of the slitlamp. The titles of the thirteen chapters suffice to outline the work: (1) the first anlage of the vitreous tissue; (2) the primordial vitreous body; (3) the hyaloid vitreous body; (4) the origin of the definitive vitreous body; (5) the derivatives of the hyaloid vitreous—(*a*) Cloquet's Canal, (*b*) the zonula; (6) the anterior vitreous; (7) vitreous fibers and interfibrillary substance; (8) the hyaloid membrane; (9) the closing of the fetal ocular cleft; (10) the dorsal proliferation center of the eye-cup; (11) the papillary process; (12) vessels and mesoderm in the vitreous body, and (13) cells in the vitreous body.

The last twenty-one pages contain the bibliography. Illustrations include eighteen text figures and forty-four tables with seventy-seven figures.

The reviewer was impressed by the author's masterly treatment of the subject, by his faithful acknowledgment to others and by his readiness to express his own opinion when his investigations have given him the right to take a different standpoint.

Directory of Ophthalmologic and Otolaryngologic Societies *

FOREIGN

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM

Time: April 11-13, 1929.

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Secretary: Dr. C. G. Russ-Wood, 12 St. John's Hill, Shrewsbury, England.
Place: Oxford, England. Time: July 4-5, 1929.

INTERNATIONAL

INTERNATIONAL CONGRESS OF OPHTHALMOLOGY

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NATIONAL

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President: Dr. Harold S. Muckleston, 6422 Hollywood Blvd., Los Angeles.
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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

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Chairman: Dr. Walter A. Wells, 1606 20th St. N. W., Washington.
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Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Arthur J. Fort, Medical Arts Bldg., Atlanta, Ga.
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Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

INDIANAPOLIS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Lafayette Page, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

NEW ORLEANS OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. M. Earle Brown, Maison Blanche, New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans. Time: 8 p. m., third Thursday of each month from September to June.

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Chairman: Dr. Clyde A. Clapp, 513 N. Charles St., Baltimore.
Secretary: Dr. Aaron Robinson, 2335 Eutaw Pl., Baltimore.
Place: Medical and Chirurgical Faculty, 1211 Cathedral St., Baltimore. Time: 8:30 p. m., fourth Thursday of each month from October to May.

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President: Dr. Donald Owen, Medical Arts Building, Omaha.
Secretary: Dr. Sanford R. Gifford, Medical Arts Building, Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7:00 p. m. Third Wednesday of each month from October to May.

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Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

BROOKLYN OPHTHALMOLOGICAL SOCIETY

President: Dr. Robert M. Rogers, 680 St. John's Pl., Brooklyn.
Secretary: Dr. William F. C. Steinbugler, 515 Ocean Ave., Brooklyn.
Place: Kings County Medical Society Bldg., 1313 Bedford Ave., Brooklyn.
Time: Third Thursday of February, April, May, October and December.

EASTERN NEW YORK EYE, EAR, NOSE AND THROAT ASSOCIATION

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Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.

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Secretary: Dr. T. B. Johnson, 30 W. 59th St., New York.
Time: 8:30 p. m., third Monday of every month.

ROCHESTER EYE, EAR, NOSE AND THROAT SOCIETY

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Secretary-Treasurer: Dr. Cecil B. Heit, 29 N. Goodman St., Rochester, N. Y.
Place: Rochester Medical Assn., 113 Prince St. Time: 8 p. m., third Monday of each month from October to May.

THE OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

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Place: Winton Hotel. Time: Fourth Friday of each month.

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Place: Salt Lake City. Time: July 1-3, 1929.

SECTION ON OPHTHALMOLOGY, COLLEGE OF PHYSICIANS, PHILADELPHIA

Chairman: Dr. C. E. G. Shannon, 17th and Walnut St., Philadelphia.
Clerk: Dr. L. F. Appleman, 308 S. 16th St., Philadelphia.
Time: Third Thursday of every month.

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Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

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Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

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Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

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President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
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Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

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AMERICAN ... ASSOCIATION

CONTENTS

PAGE

The Relationship Between Inflammation of the Posterior Sinuses and Disease of the Nervus Opticus. Georges Weill, M.D., Strasbourg, France..... 307

Retinal Degeneration in Macular Region Without Cerebral Symptoms. Arnold Knapp, M.D., New York..... 312

Marked Epiblepharon with Retroflection of the Eyelashes of Both Lower Lids in an Adult Mongolian. Arnold Pillat, M.D., Peking, China..... 318

The Perretinal Artery: An Anatomic Study. Isadore Goldstein, M.D., and David Wexler, M.D., New York.. 324

Cataract in Myotonic Dystrophy. S. R. Gifford, M.D.; A. E. Bennett, M.D., and Nora M. Fairchild, M.D., Omaha... 335

Ocular Disturbances in Epidemic Encephalitis. Foster Kennedy, M.D., F.R.S. (Edin.), New York..... 346

Circumcorneal Transplantation of Buccal Mucous Membrane as a Curative Measure in Diseases of the Eye. Rudolf Denig, M.D., New York..... 351

Cultivation of Lens Epithelium in Vitro: A Further Study. Daniel B. Kirby, M.D.; Keith Estey, and Florence Tabor, New York..... 358

Obituaries:

J. M. Hanister, M.D..... 366

Notes and News..... 368

Abstracts from Current Literature..... 373

Society Transactions:

The German Ophthalmological Society..... 385

Société de Neurologie..... 421

Royal Society of Medicine, London, Section on Ophthalmology..... 425

Book Reviews..... 430

Directory..... 431